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* Fabian, L. W.; Newton, G. W.; Stephen, C. R.; Anesthesiology March-April issue.

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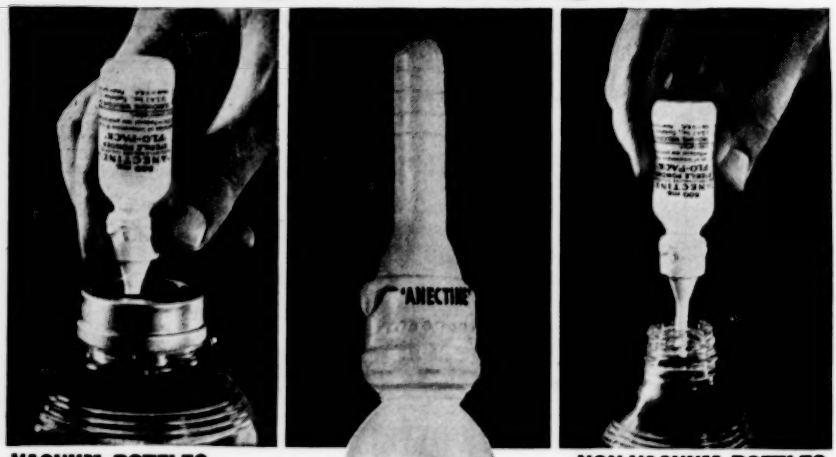

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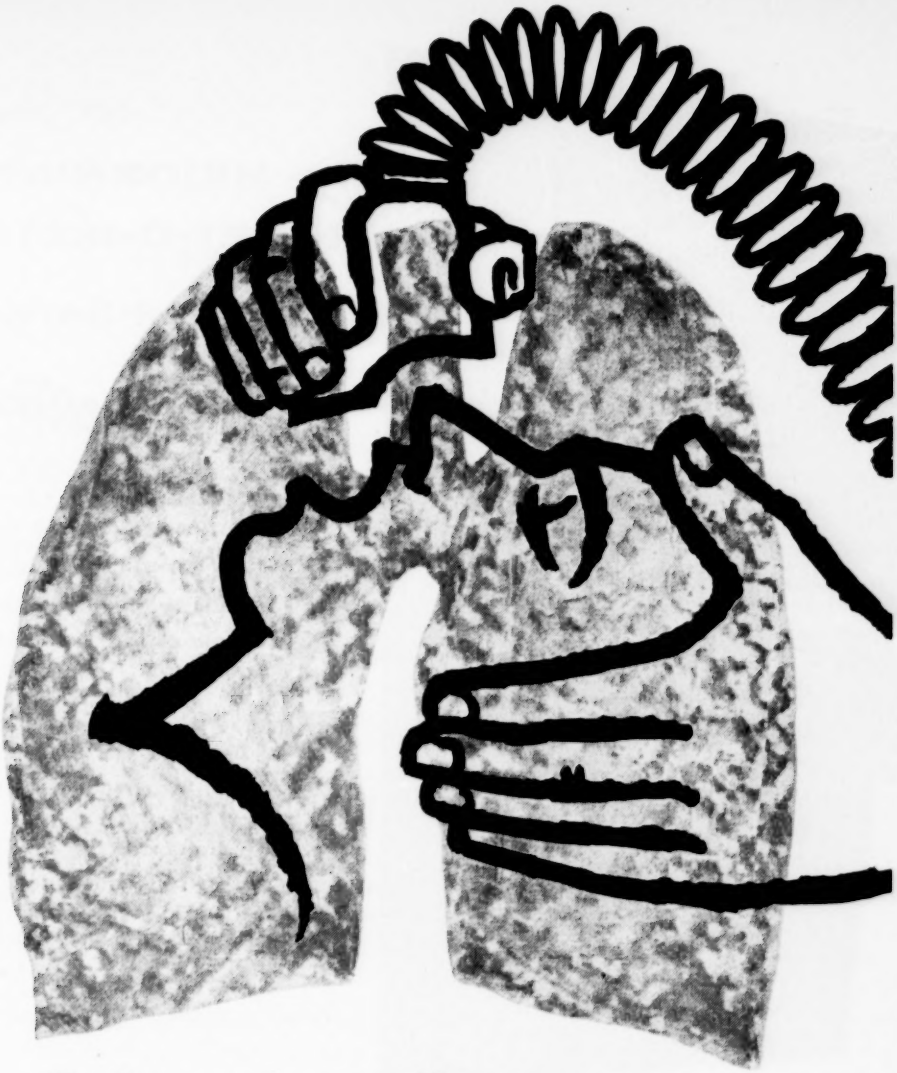

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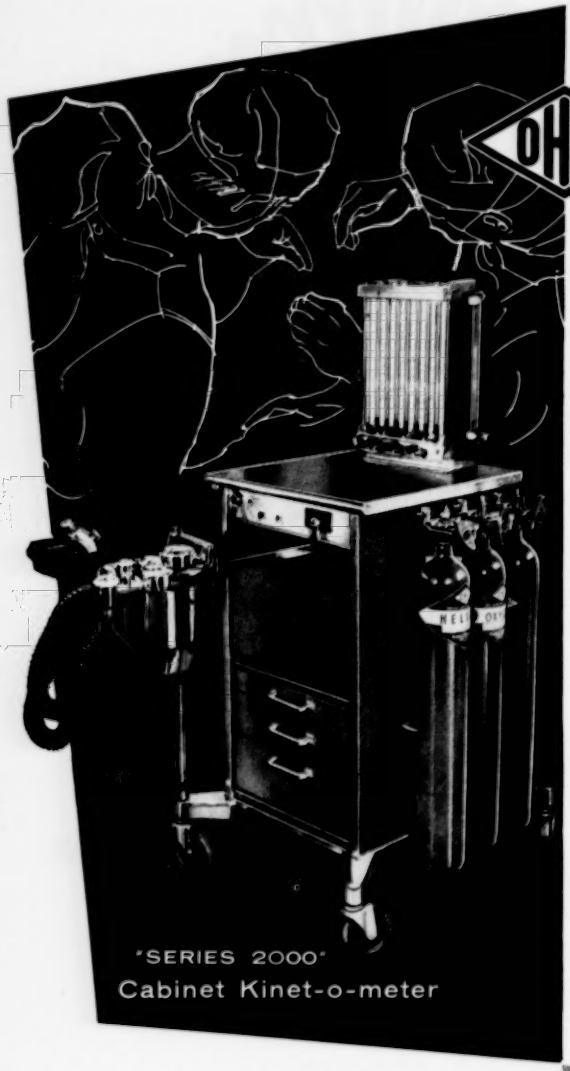

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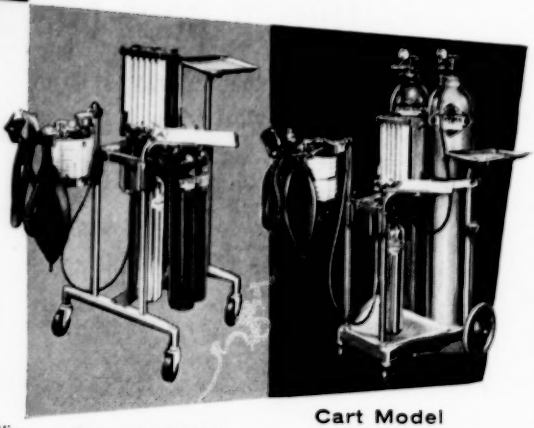

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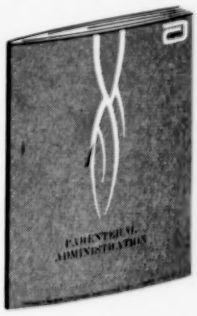

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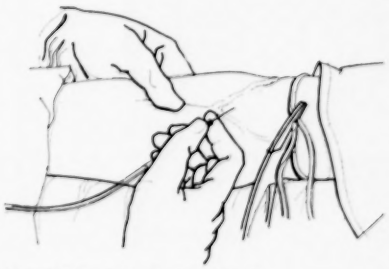

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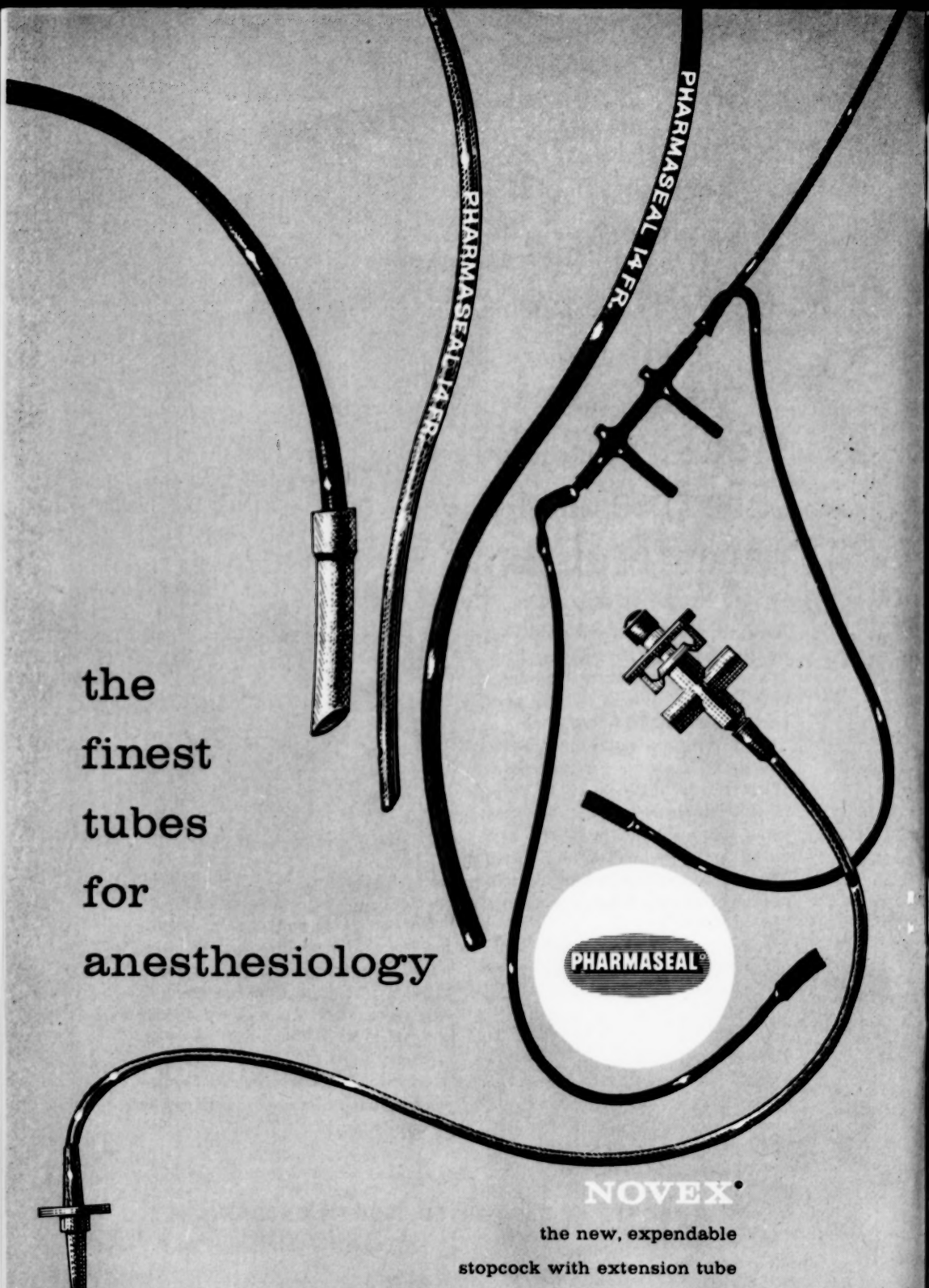

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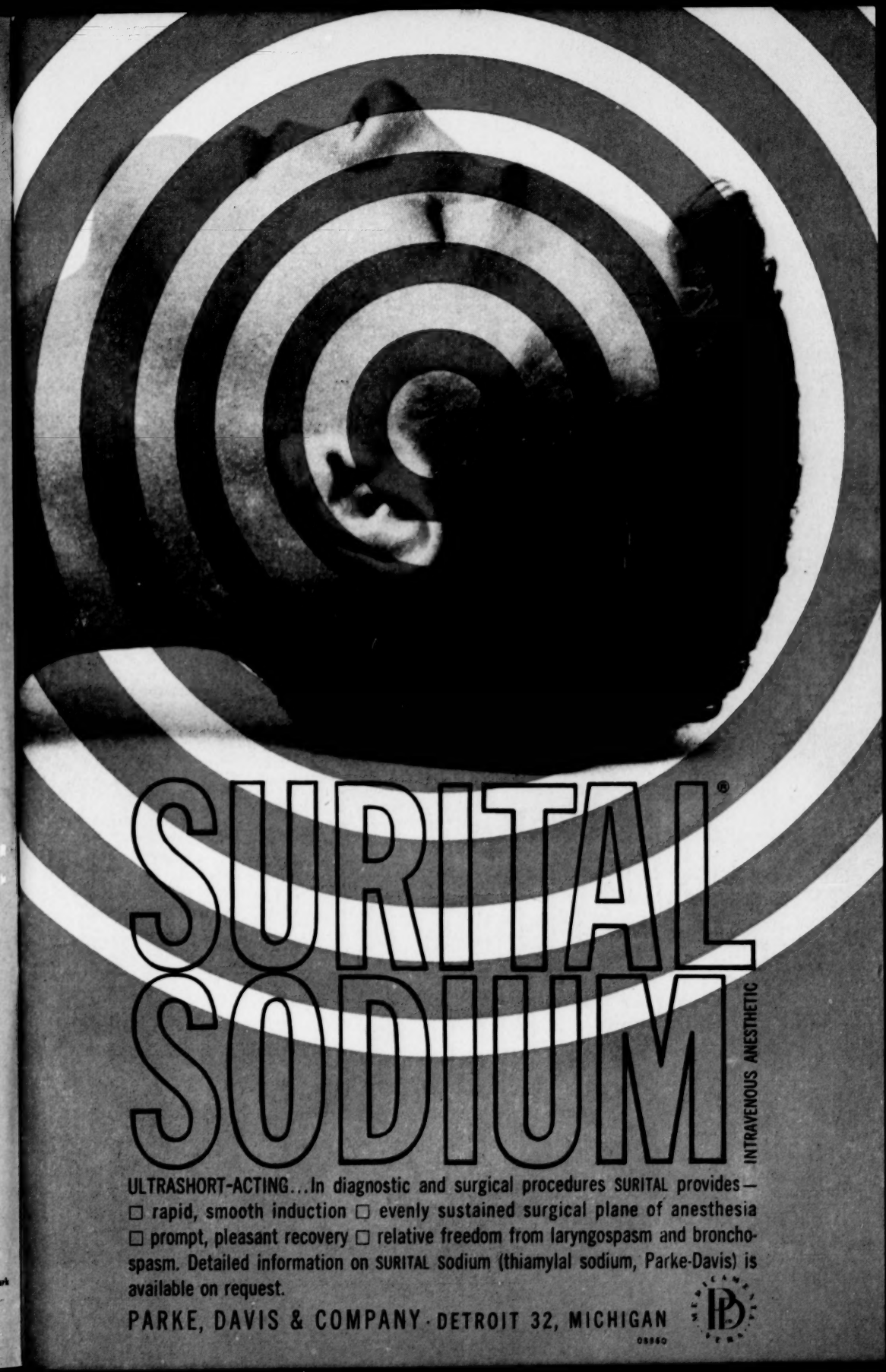

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Infant Anesthesia

Betty E. Lank* and Patricia Foley*
Boston, Massachusetts

Infant Anesthesia is a subject which in recent years has been discussed many, many times, but there are always new ideas appearing as there are with any other subject. These remarks will be confined strictly to the practical aspect of the subject.

Man in his evolutionary struggle for survival has to be ever watchful over his young, because here is the basis of the perpetuation of his species. By this watchfulness he tries to safeguard these future useful citizens of his society by the best possible physical as well as educational and spiritual means.

Keeping this in mind then, the physical care of sick children and nursing them back to health is of paramount importance and it is on this basis that the Children's Medical Center is set up. However, starting them on the road to health and trying to keep them there is by no means an easy task.

Arriving from all parts of New England, and from far distant places, at odd times of the day and night, someone always has to be able and ready to start these infants on the sometimes difficult journey towards their physical well being. Successful handling of emergencies is possible only if the hospital is prepared to meet these situations at all times.

Many of the infants who arrive at Children's Medical Center have barely joined our society, others have been in it only a few months. A total of 1,900 surgical procedures were performed in the years 1957 and 1958. The youngest of this group was only 2 hours of age, the oldest one year of age. The smallest of the group weighed 1 lb. and 11 oz.

The work includes:—

1. General surgery
2. Chest surgery such as
   Cysts within the chest cavity, lung and mediastinal tumors, tracheal compressions, tracheo-esophageal fistulas with esophageal atresias and diaphragmatic hernias.
3. Ear, Nose and Throat Surgery
4. Orthopedic Surgery
5. Cardiac Surgery

To be discussed today will be the four major surgical emergencies in the newborn.

1. Intestinal obstruction in the newborn
2. Diaphragmatic hernias
3. Omphaloceles of the newborn
4. Tracheo-esophageal fistula with esophageal atresia

These conditions present grave problems in these tiny patients.

* Children's Medical Center, Boston.
Presented at the Annual Meeting, American Association of Nurse Anesthetists, New York City, August 24, 1959.

No matter how small an infant, some type of anesthesia can usually be given to allow the surgeon adequate operating conditions. This, as a rule, makes for a faster, more efficient operation and usually guarantees a better surgical correction.

Premature infants under four pounds usually are given local anesthesia as general anesthesia is poorly tolerated in this age group. 1/2% novocaine is infiltrated and N_2O-O_2 is blown over the infant's face. This is usually sufficient to keep them quiet.

In these infants as well as all other children, a stethoscope is of great importance to the anesthetist. Heart sounds and breath sounds are continuously monitored to assure us that all is well or not well with our tiny charges.

We have obtained small blood pressure cuffs which allow us to take blood pressures on all infants. These are made of rubber, the widest part being 1½". Blood pressure is generally measured by palpation. Ordinary blood pressure stethoscopes usually occlude the artery.

It is also important to maintain body temperature in such cases. This is done by wrapping the infants' extremities in sheet wadding and placing warm water bottles at the feet of the baby. A conductive electric rubber blanket is frequently used.

Due to surface exposure and wet drapes, infant temperatures decrease very rapidly. Temperatures have been known to fall two degrees following an ether preparation of the operative field. Therefore, ether is sometimes omitted, especially in the debilitated and the premature baby.

To the normal newborn infant, atropine, 0.1 mg. 30 to 40 min. preoperatively is given and to the premature infant 0.05 mgm. of atropine. This tends to reduce reflex vagal stimuli and to dry secretions.

Many times newborn and premature infants are intubated awake. With this technique, there is less chance of laryngospasm and an adequate supply of oxygen is assured. Regurgitation may occur but the infant is able to take care of any secretions because his reflexes are still intact, secondly the glottis is protected by the tube which is guarding against aspiration.

An important factor in "awake intubation" is to have two people present whenever possible. The assistant aids the anesthetist by holding the infant's head in position and the shoulders flat, also to apply light pressure on the larynx when necessary. He or she is very valuable in doing the extra incidental things which are important in completing a smooth, neat anesthesia. It is always well to have various sizes of endotracheal tubes because of the variance in the size of the trachea. Our most useful size is the #12 French Magill (red rubber). This is not hard enough to cause trauma and yet is sufficiently rigid so that kinking does not occur. Equipment used for endotracheal anesthesia should be surgically clean as one of the complications of infant and premature anesthesia is infection due to unclean equipment rather than from trauma. The agents used are administered by the to-and-fro method, or the Bloomquist Circle Filter, depending on the age and weight of the infant. It is surprising to find that, small as they may be, infants require a large amount of the anesthetic to keep them adequately anesthetized.

Following the operation, the pharynx and larynx are suctioned well. An efficient way to suction small endotracheal tubes is with polyethylene tubing of the 19 gauge. This size tubing fits into a #8 French catheter which is in turn attached to regular suction tubing. As soon as the infant is awake and breathing well, the tube is removed. Suctioning should not take place through the endotracheal tube while the patient is being extubated. This removes oxygen from the lungs and also tends to cause laryngospasm. When extubation is accomplished, oxygen is given with a bag and mask. Needless to say the anesthetist is listening to heart and breath sounds while this is all taking place.

We think it may be good to mention here that all patients are brought to the recovery room postoperatively until they are awake and responding. If the case happens to be late at night, the anesthetist remains with the patient until he has fully responded and his respirations are adequate to allow the return to his own room. Warm blankets are available and isolettes are kept at 80° to assure warmth, and mist is given if necessary. 40% rather than 100% oxygen is used for premature infants only if necessary to avoid retro-lental fibroplasia.

Intestinal Obstruction

These babies come to surgery in various stages of dehydration and abdominal distention and are more or less sick babies. Obstructions may be due to intestinal atresia, abdominal cyst or tumor, obstruction with perforated gut, or malrotation of the intestine. Infrequently we find an ordinary band of adhesion but it does cause marked distention. Probably the more serious cause, and certainly the one with the highest mortality rate, is the meconium ileus. This manifests itself by a deficiency in proteolytic enzymes of the glands. At surgery the intestines are filled with a substance looking like putty but very sticky and gummy. This cannot be removed either by suction or squeezing. Ileostomy will be the operation for this condition and then prolonged enzyme irrigation in an attempt to clear the intestine.

All possible anesthesia time is saved on the very ill or premature baby, hence the surgeon will place the cut-down infusion under local anesthesia in the ankle veins. This will save at least ten minutes anesthesia time, which is of vital importance to these small babies. During the cut-down procedure oxygen is administered by the anesthetist. If kidney or abdominal tumor masses are present, the infusion is placed in the arm, as pressure from the mass may cause kinking or obstruction to the vena cava, thus blood is unable to be replaced rapidly if hemorrhage or shock occurs. Unnecessary deaths have been reported from this sequence of events.

Gastric content is aspirated and frequently the Levin tube is irrigated with normal saline before anesthesia starts. The Levin tube is left open for drainage during surgery and light suction applied periodically, as manipulation of the dilated bowel causes fluid to ascend the alimentary tract. Low Bell suction is applied to the Levin tube postoperatively for so long as is necessary. Awake intubation is carried out, especially for those with abdominal distention, also for those who are acutely ill and weak. We feel the awake intubation

safeguards the lung from fluid which can so easily ascend from the dilated bowel and stomach. The normal baby without bowel distention can safely be put to sleep without intubation and by the open-drop method of Vinethene, ether and oxygen.

Omphalocele

Omphalocele is a herniation of abdominal viscera into the base of the umbilical cord. The covering consists only of a transparent membrane. The omphalocele varies in size from that of a walnut to that of a grapefruit.

It is imperative that these babies come to surgery as soon after birth as possible and indeed occasionally, one hour after birth finds them on the operating table. The sac is usually moist and pliable, but as the hours go by, it becomes dry, necrotic, shrivelled and friable. Then there is a tendency to rupture. Evisceration and infection ensues. The larger the sac, the more difficult it will be for the surgeon and anesthetist. The walnut sized omphalocele presents no difficulty and all abdominal layers will be closed, but at times the orange and especially the grapefruit size presents severe difficulties in trying to place the viscera into an under-developed abdominal cavity. This is no easy task.

The omphalocele of the walnut size can be repaired under anesthesia of the simple and, as some anesthetists feel, old-fashioned open drop method. Respiratory difficulty is not encountered wtih this type of procedure. If the open drop method is used, oxygen of at least 500 c.c. is continously flowing under the mask.

The larger type omphalocele presents grave and occasionally disastrous results. All room possible is needed for the placing of the viscera. This is accomplished by squeezing the organs into the abdominal cavity and in so doing, the diaphragm is pushed upward, markedly reducing respiratory exchange. These babies are intubated awake and our anesthetic of choice is cyclopropane. For better relaxation, ether is added but this is discontinued with the closure of one layer over the viscera. Our general rule is not to use a relaxant drug, as this reduces muscle tone and adequate ventilation may be delayed with serious consequence. If one feels the absolute need of a relaxant, then we give succinylcholine 0.5 c.c. intramuscularly. Good relaxation may be obtained in 15 seconds, since the absorption is rapid if the baby is in good condition. We would hesitate to use this in any premature or debilitated baby. We are especially cautious in the choice of the endotracheal tube. A snug fitting tube may cause tracheal edema and this we surely want to avoid in both the omphalocele and diaphragmatic hernia. Generally used is the #12 French Magill, which seems very satisfactory for most babies.

To accomplish a four layer abdominal closure is extremely rare in the larger type of omphalocele. Frequently this is accomplished, only to be taken down rapidly as these babies become cyanotic with extreme inadequate ventilation from pressure on the diaphragm and lungs. On the larger type, only the skin is brought together until secondary closure can be accomplished, this taking place when it is felt that the child's abdominal cavity is sufficiently large to receive the organs. This is generally when the child is between two and three years old.

If tracheal intubation is not necessary and the to-and-fro or infant circle with face mask is used, the anesthetist should be careful not to over-distend the stomach by assisting respirations as this may lead to respiratory distress by impeding the descent of the diaphragm. Intermittent suction applied to the Levin tube should begin if such an accident occurs.

Congenital Diaphragmatic Hernia

Infrequently, people go on to later life without realizing the presence of this condition, since only a minor amount of viscera is present in the chest cavity, or it may be diagnosed by an incidental chest x-ray. This, of course, is rare. Usually these babies are of normal size but will present various degrees of cyanosis, dyspnea, and respiratory distress and certainly they present major problems. The more common diaphragmatic hernia occurs in the left chest. Right diaphragmatic hernia is rare as the liver acts as a stop-gap for the viscera which might enter the chest. The left chest will usually contain spleen, stomach, small and large bowel and rarely the liver. From all of this pressure the heart will be pushed to the right, partially collapsing the right lung. At times these babies do not have to be treated as a dire emergency especially if they are admitted at night and do not present any serious symptoms. They are watched closely and supported with oxygen and mist. However, many and most of them have to be treated as immediate emergencies. An endotracheal tube will sometimes be placed and mouth-to-tube insufflation instituted until oxygen and proper equipment is in readiness. The babies who are not presenting drastic respiratory difficulties can and may be done without tracheal intubation with assisted respirations by the to-and-fro or infant circle methods. However, this does have its complications, mainly due to distended stomach and intestines, caused by positive pressure, which hampers the replacement of the organs into the abdominal cavity.

The severe diaphragmatic hernia presents serious problems for the anesthetist. First and most important is that the left lung is completely collapsed and only partial aeration of the right is present due to the misplaced heart. One must be overly cautious in the amount of positive pressure used in these unexpanded lungs. Not over 15 cm. of water pressure is sufficient and we feel that this is a fairly safe pressure. Alveolar weeping with all its complications, occurs if there is too much pressure and it is felt to be a much safer procedure to pull the lung into expansion postoperatively by Bell suction attached to the chest catheter. In the last few years the abdominal-thoracic approach has been our practice and this in itself is a large order for these small babies perhaps only a few hours old, but babies in the first 48 hours of life withstand surgery amazingly well. This approach makes for an easier reduction of the hernia.

The usual handling of the anesthetic is as follows: Awake intubation and light cyclopropane for the hernial reduction. Motion of the diaphragm is disturbing to the surgeon and also tiring to the baby. Deepening of the anesthetic and controlled respirations with slight positive pressure is most helpful. Before placing the viscera into the small abdominal cavity, better relaxation is essential and ether is added rather than giving a relax-

ant, because of the unexpanded lungs and the low tolerance which is common in newborn babies. A prolonged apnea may occur if a relaxant is used. The anesthetist can help these babies by controlled respirations but it is worrisome until muscle tone and reflexes have returned.

Cardiac irritation may be observed with the expulsion of the viscera from the chest and this is easily controlled by emptying the breathing bag and giving pure oxygen for several breaths. We do not hesitate to repeat the initial dose of atropine as this will strengthen the myocardium and better rate and tone will follow.

The abdominal-thoracic approach makes it easier to repair the malrotation of intestines which sometimes will accompany diaphragmatic hernia. Here the abdominal cavity is usually larger than in the omphalocele group, hence closure of the layers tends to be not quite such a task. If a large part of the abdominal viscera has been in the thorax, then the abdominal cavity will not be stretched and only the skin layer can then be closed and a secondary closure of the layers must be done at a later date.

These babies are left on chest suction until the hazard of pneumothorax is past. On occasion this postoperative complication has presented itself.

Tracheo Esophageal Fistula with Esophageal Atresia

For the past twenty-four years many methods for anesthetizing these babies have been undertaken. One method was by local infiltration and the flowing of nitrous oxide and oxygen over the baby's face. Another was rectal Avertin, local infiltration and small amounts of nitrous oxide and oxygen. Still another method—open drop ether with oxygen, of course hoping that the pleural cavity would not be entered.

Many, many fatalities occurred in the early days as indeed we lose them today, but there are three factors making for better survival rates. 1. Cyclopropane came to the front. 2. Earlier diagnoses due to more pediatricians in the field. 3. Changes in surgical technique.

There are six different types of this abnormality, the more common being a blind upper segment of the esophagus and the lower segment communicating with the trachea. Frequently diagnosis has been delayed for several days, consequently, pneumonia will be a major complication. This is due to excessive saliva and the feedings of the baby, both spilling over into the trachea. When the baby enters the hospital with this diagnosis, suction is immediately applied to the catheter which is placed in the upper pouch. A gastrostomy with local infiltration is performed with an anesthetist in attendance. This is done night or day regardless of the time. This serves as a good safety valve. The baby is placed in a 75 degree sitting position to guard against the feeding trickling up the lower segment of the esophagus into the trachea. Within twenty-four hours the primary anastomosis of the esophagus with closure of the fistula takes place. As a general rule awake intubation with cyclopropane and oxygen is the anesthetic of choice. During this operation retractors are used for better exposure and one must be ever watchful that the lung is not collapsed for too long. The surgeon is most intent and cautious but will sometimes forget that the lung must

be aerated. It is best to remind him every ten minutes. We have found that surgeons are very happy to permit the lung to be expanded as soon as circumstances allow it.

A number of years ago, primary anastomosis with the fistula closure would be done shortly after the admittance of the babies to the hospital. More recently it has been our practice, on the debilitated and weak baby, to do a gastrostomy and closure of the fistula. Doing the primary anastomosis when the baby is stronger, and the pneumonia treated, the infant will stand a far better chance for survival.

The premature group is treated slightly differently. If the weight is under four pounds, the gastrostomy and fistula closure is done with local infiltration, perhaps blowing nitrous-oxide and oxygen over the baby's face. They are left then to grow up to five pounds before primary anastomosis is attempted.

Thus far, man in his struggle for survival has managed to travel a long way from the days when none of these diseases were recognized and therefore could not be treated. As a result more infants are living and becoming not only useful citizens but important ones as well.

Geriatric Anesthesia

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In recent years, anesthesia and surgery have become more complicated by the additional factor of senility with its attendant multiplicity of diseases. Despite this, the statistical increase in morbidity and/or mortality in this group is not much greater than that of the younger group.

Even though life insurance actuarial tables indicate the life span of the male to be 64 and that of the female to be 69, there are other factors which make these figures grossly misleading. Age in relationship to anesthesia must be compounded of both physiological and chronological age, not just the latter alone. This age is composed of type of daily activity, functional capacity of various organs, mental acuity, physical appearance, and emotional stability. With these factors before us and with more aged patients being treated surgically each year, it is imperative that they be provided with the optimal anesthetic care before, during, and after operation. Much has been said about preoperative preparation, anesthetic agent, and surgical judgment. To this triad must be added a factor which is very often overlooked or conveniently forgotten — the surgeon should provide the best anesthetic care possible for both his patient and himself. It has been said that the greatest role of anesthesiology is to protect the patient from the onslaught of the surgeon. This aphorism, of course, is a potential boomerang.

It is obvious that as one grows older his physiologic mechanisms undergo change. The aging process is manifested by dry skin, changes in pigmentation, brittle nails, loss of teeth and hair, weight decrease, etc. The primary changes in the aging individual, however, which concern us are the internal organs which are not easily judged by inspection. These internal organs are, in order of importance to us as anesthetists: (1) the heart, (2) the lungs, (3) kidneys, (4) liver, and (5) brain. By and large the last three; that is, the genitourinary, hepatic, and cerebral organs may be passed over fairly briefly. Impairment of cerebral function is not of too much significance as far as the actual conduct of an anesthetic is concerned. Renal impairment makes us wary of using drugs which require renal clearance for their removal from the circulation. As is fairly obvious, if the drug is not removed from the circulation via the kidneys, its physiologic action will be vastly prolonged. This is true with such drugs as phenobarbital. Hepatic disease in this group is usually one of cirrhosis, secondary to alcohol.

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Here again, try to avoid agents which rely on the liver for their primary detoxification and conjugation.

Cardiovascular system changes are of considerable importance to us. These are usually in the category of atherosclerosis of the coronaries, loss of elasticity in the peripheral vessels, hypertension, diminished cardiac reserve, and conduction defects. A simple test to approximate an individual's overall cardiac function is to question him about his daily routine. You will be amazed to find many of these people at 75 and 80 years old are still doing a full day's work. The amount of daily activity of an individual is an excellent indication of both his cardiac reserve and his pulmonary reserve. How much can he do without dyspnea or chest pain? Almost all patients in this geriatric age group have varying degrees of coronary sclerosis. This in itself should be no deterrent to general anesthesia. The hypertensive patient is one which often frightens the individual who is to be charged with the responsibility of administering the anesthetic. The main thing in a hypertensive patient is that one should not allow a profound drop in systolic pressure. Since the coronary arteries are dependent on the systolic pressure, it is obvious that if they are accustomed to a pressure of 200 mm. of mercury and this is allowed to suddenly decrease to 110, there may be serious changes in the physiology of the myocardium.

Hypotension without hemorrhage usually occurs, if at all, during induction or immediately after intubation. In this situation, what can be done? The first thing to do is turn off the anesthetic gas and *assist* respiration with oxygen. In the majority of cases, the blood pressure will return as the anesthetic agent is "blown off," and then the anesthetic agent is used as needed. If the blood pressure does not return within five minutes or less, use a vasopressor. Ephedrine sulfate may be used if the pulse is less than 100/min. or neosynephrine hydrochloride if the pulse is more than 100/min. The prevention of these profound periods of hypotension is primarily based on vigilance, ventilation, and essence of good judgment.

In the conduct of an anesthesia, the pulmonary system is probably the most important to us. However, the separation of the cardiovascular system and the pulmonary system into two separate entities is a very difficult and dangerous thing to do. Diseases which affect one or the other or both of these systems are so intimately inter-related to the other that they must be considered as a unit. Since ultimate cardiac function is dependent upon oxygen, it follows that any disease or condition which will impair the oxygenation of the organism in question is probably the most important factor in the conduct of an anesthetic. Almost all people over the age of 40 have, to a greater or lesser degree, bronchitis, emphysema, and/or pulmonary fibrosis. The latter two diseases are the most important to us as anesthetists.

Emphysema is outwardly manifested by a barrel-shaped chest, rigidly fixed in the inspiratory position and associated with fatigue of the respiratory muscles. Since the lung is held in almost maximal inspiratory position, there is obviously diminished elastic recoil resulting in decreased pulmonary ventilation. There

are many areas of the lung in which the alveolae have coalesced to form what are called emphysematous bullae. These do not take part to any great extent in transport of oxygen or to the removal of carbon dioxide. Therefore, carbon dioxide is retained in these bullae, and the total ventilatory surface or capacity of the lung is decreased. These patients have chronic carbon dioxide retention which makes them susceptible to apnea induced by hyperventilation. They present a problem during the induction of anesthesia and also during the maintenance period if ventilation is too vigorous. These patients should not be in an oxygen tent postoperatively unless it is absolutely necessary, nor should oxygen be administered nasally for any extended period of time. The respiratory center of the emphysematous patient requires a high concentration of carbon dioxide to function and if the carbon dioxide is mechanically washed out with a high flow of oxygen in the inspired mixture, the patient will remain apneic.

Pulmonary emphysema is almost always associated with pulmonary fibrosis. This is usually secondary to repeated chronic infection of the lung. The amount of interstitial fibrosis within the lung parenchyma is increased with a consequent reduction in vital capacity and diminution of the vascular bed of the lungs. Hypertrophy of the right ventricle follows, with the end result being right heart failure. Since there is a decrease in the amount of aerating surface in the lung due to the increased interstitial fibrosis, it follows that there is a reduction in the vital capacity, uneven intrapulmonary distribution of inspired gases, and a decrease in maximal breathing capacity. This is usually out of proportion to the diminished vital capacity. In spite of these changes, relatively normal values for arterial oxygen saturation, CO_2 and pH are maintained. These individuals are able to carry on moderate activity without dyspnea. However, their pulmonary reserve for real exertion is limited. The simple breath-holding test is helpful to estimate the pulmonary reserve and function, in a rough manner, in any individual. The average normal patient can hold his breath for 35 to 40 seconds. If the patient is unable to do this, it will indicate a decreased pulmonary reserve and a relatively rapid accumulation of arterial CO_2 tension. The breath-holding test and amount of daily activity are two simple methods of estimating pulmonary and cardiac reserve.

With this brief physiological review, it becomes apparent that we are concerned not only with the type of agent and the conduct of anesthesia, but with the immediate preoperative condition of the patient. This is the time to correct secondary anemias, dehydration, diabetes, hypo- or hyperthyroidism, bronchitis, oral sepsis, decreased blood volume, and plasma proteins. All these conditions lend themselves to preoperative correction to a greater or lesser degree. It behooves us as anesthetists and as part of the surgical team to urge the surgeon and the internist or whoever might be concerned with this patient besides ourselves, to correct these entities before they come to the operating room. Obviously, in emergency surgical procedures, this is not possible. Again, with the geriatric patient, we must be careful in the amounts and rate of administration

of intravenous fluids that are used. These people do not tolerate massive enlargement of their effective circulating volume. One must remember that in any patient with a chronic illness, the effective circulating blood volume is considerably less than that which is calculated on the basis of weight and height of the individual. Therefore, a routine hemoglobin is somewhat misleading since it will probably be a higher value than the actual hemoglobin value. However, it is still a good method to check the oxygen-carrying capacity of the blood. Without exception, any patient coming to the operating room for anesthesia of any kind should have a written history and physical examination, a hemoglobin determination, and a routine urinalysis. Each one of these items provides us with clues as to this patient's physiological state.

In addition to the above-mentioned preoperative facts, one should pay particular attention in the old patient to water and electrolyte balance. This is especially true of the patient who is to have an emergency surgical operation for bowel obstruction. The old adage of intubate, hydrate, and operate is one which is often neglected. There is no emergency, short of acute hemorrhage or acute respiratory obstruction which demands immediate operation. In the vast majority of cases, one can wait three or four hours before operating, during which time gastrointestinal intubation may be accomplished and appropriate intravenous fluids administered. As far as transfusion is concerned, it has been well shown by clinical and laboratory studies that the body requires approximately 24 hours in which to adjust to the transfusion of whole blood. Hence, a hemoglobin determination immediately after transfusion is misleading. Therefore, blood transfusion preoperatively within one or two hours will not really correct a low hemoglobin but will combat the stress of operation and anesthesia. Another important facet of the preoperative preparation of the geriatric patient is the question of cardiac failure or cardiac decompensation with preoperative digitalization. There are two schools of thought on this particular subject, one of which in certain carefully selected individuals feels that the patient should be digitalized empirically preoperatively; the other feels that the use of digitalis should be reserved strictly for those who show clinical signs and symptoms of cardiac decompensation. This is a question for the internist to decide and as a member of a team, his recommendation should be followed.

The next important facet of geriatric anesthesia is that of preanesthetic medication. Premedication should be based on chronologic age and not the apparent physiologic age of the patient. Many elderly patients appear to be spry and considerably belie their chronological age. However, as far as premedication is concerned, they more often than not run true to their chronological age. A constant observation in this group is that they have lowered metabolism and depression of mental acuity. The essential thing is not to cause respiratory and circulatory depression while attempting to decrease apprehension, salivation, and amount of anesthetic agent required. Each individual patient must have the premedication tailored to fit his needs. There cannot be an inclusive rule to follow since this leads to patients with cardiovascular and respiratory depression.

It is our practice at The University of Texas M. D. Anderson Hospital and Tumor Institute to use a barbiturate for sleep the night before. During the past year, the combination of Demerol-Phenergan-scopolamine has been routine as preoperative medication. It has been obvious that a fair number of the elderly patients over age 65 have become confused, disoriented, and in some cases maniacal with this combination. This is probably due to the scopolamine. Scopolamine was eliminated as a routine premedicant. It must be remembered that Phenergan is synergistic with Demerol in a similar manner to that of the Thorazine group. Therefore, small doses of Demerol are administered. Demerol, 25 or 50 mg. with 12 1/2 or 25 mg. of Phenergan, respectively are used. This ratio appears to be satisfactory since there is little apprehension and adequate suppression of oral secretions. This is practically the same effect as atropine as far as oral secretions are concerned. In this respect, one does not want to decrease oral secretions to the point of dryness since the cough reflex is not as vigorous as in a younger patient. A point of no return is reached if the respiratory tree is too dry. Nembutal, in 50 or 100 mg. doses is used for sleep at night and is omitted the morning of operation in the very old patient. All patients undergoing subarachnoid block, regional anesthesia, or local infiltration anesthesia are given Nembutal prior to operation.

Morphine or its derivatives serve no useful purpose in the aged patient. The reason for this is that morphine is extremely unpredictable as to which patient and at what dose it will seriously depress ventilation. The simplest possible combination of drugs and agents which can be used to accomplish the aim of the procedure is the one to use. If an overdose of morphine or any of the opiates be given resulting in relatively profound respiratory depression, the effects may be very quickly and adequately reversed by the use of Nalline (n-allylnormorphine hydrochloride). This drug is a specific for opiate-induced respiratory depression and is given by the intravenous route in 10 mg. increments. Its effect is obvious within one or two minutes after injection. The respiratory rate increases in both minute volume and rate almost immediately. The increased respiratory exchange may persist for several hours. After the effect of Nalline has subsided, the patient may return to respiratory depression. Nalline may be given again, and again one would note the same result as before. Nalline has no effect against barbiturate depression or anesthetic overdose.

The next subject is the anesthetic agent itself. The most important consideration is to use the most familiar agent and technique. Any of the agents available today would be sufficient for almost any given situation, but there is usually one agent with which we are most familiar as an individual. This should be the basic agent for the routine conduct of anesthesias. If you have a critical case or a case demanding careful assay and execution of technique, rely on the agent which you use best and are most expert in administering. The three most important general anesthetic agents, in order of importance, are diethyl ether, cyclopropane, and the newer agent, Fluothane. Ether has been in use for over 100 years

and is still an excellent agent. Perhaps its primary drawback from the patient's standpoint is that of pungent odor. It has been condemned by many in this country in recent years as being an old fashioned and outmoded agent. Ether, when properly handled, will do everything that any other agent known will do and perhaps do a bit better in the hands of an experienced anesthetist or anesthesiologist. One of its primary drawbacks, so the critics say, is its production of nausea and vomiting after its use. This aspect of ether anesthesia is related to the way in which it is given and to the amount used. It is not uncommon at The University of Texas M. D. Anderson Hospital and Tumor Institute to do four to six-hour procedures using two ounces of ether. According to the staff, postoperative vomiting and nausea is not a problem. One certainly cannot complain about using too much ether when these amounts are considered. When considering anesthetics in general, the same criteria hold true with them as with premedication; that is, the older patients do not require as much anesthesia comparatively speaking as the younger age group. In many respects, the conduct of an anesthetic for the geriatric patient is similar to that of the pediatric patient. Neither group of patients will tolerate poor technique or inattention to ventilation and fluid replacement. As one might imagine, the cardiac reserve in most aged patients is limited and will not tolerate wide variation in either blood pressure or pulse pressure. Nor will they stand any compromise in the realm of ventilation. It is quite true that ether anesthesia does increase the circulating blood sugar. This should not contraindicate its use in the well-controlled diabetic patient and in whom the anesthetist uses adequate insulin dosage with intravenous fluids. Cyclopropane has a tendency to sensitize the myocardium to both reflex stimuli and to an increase in endogenous epinephrine. This particular facet of the conduct of a cyclopropane anesthesia can be controlled if ventilation is maintained at a constant and adequate rate. If one does not use a small dose of a rapid-acting barbiturate intravenously before the anesthetic mask is placed on the patient's face, cyclopropane is probably the better choice of the two agents for the induction of anesthesia. Likewise, Fluothane does not have an objectionable odor and it too can be used without the preliminary use of a barbiturate. Neither cyclopropane nor Fluothane will produce adequate muscular relaxation by themselves unless dangerously deep levels of anesthesia are obtained. Obviously, this defeats the whole purpose of anesthesia for any age group and, therefore, muscle relaxants must be used with these agents in light planes of anesthesia. When using Fluothane, one must never use d-tubocurarine or curariform drugs since these drugs and Fluothane are synergistic. With Fluothane, succinylcholine or other agents in this group are the choice. Fluothane must be given with a vaporizer designed specifically for its use.

With any anesthetic agent, regardless of the variety, whether it be intravenous or inhalation, the most important prerequisites to a smooth, safe anesthetic course are utterly dependent on two factors; namely, vigilance and ventilation. All general anesthesias must have assisted ventilation throughout their course. This

means constant, unremitting, rhythmical assisted respirations. One hand must be on the breathing bag, rhythmically assisting the patient's pattern of respiration. In the vast majority of the so-called "cardiac arrest" situations, there are three underlying common denominators: hypoventilation, hypoxia, and hypercarbia. These three are all interdependent on each other and can all be obviated by adequate ventilation. There has been no experimental or clinical evidence to show light planes of anesthesia predispose to cessation of the cardiac pump. Furthermore, in addition to unremitting constant ventilation, there is no substitute for a clear, dry, unobstructed airway. When using the muscle relaxants, there must be an endotracheal tube in place. Therefore, if one is to use the muscle relaxants as an adjunct to anesthetic management it is essential to become adept in accomplishing an atraumatic endotracheal intubation. There is a definite knack and art in doing this procedure, and one in which many people never acquire the necessary degree of skill. To the observer, it looks like a simple procedure. but it is not as easy as it looks. However, this simple maneuver is so necessary to the conduct of a good anesthetic and, in many cases, to the patient's very existence, that we must strive for the utmost in skill and ability in accomplishing this.

It might be appropriate near the end of this discussion to say a word about anesthetic emergencies and some of the contributory factors committed by the anesthetist which complicate a surgical procedure. At one time or another, we have all been confronted by the patient who is brought to the operating room with a markedly distended abdomen, dehydrated, and possibly anemic, with a diagnosis of an intestinal obstruction. This usually occurs in the middle of the night when there is little help available in the operating room. This patient presents a definite challenge to the anesthetist in that he inherently carries the highest morbidity and mortality rate, probably, of any patient who comes to the operating room. This is based on the fact that a patient with intestinal obstruction almost invariably has the upper gastrointestinal tract distended with fluid. As soon as the patient is anesthetized, this fluid regurgitates to the oral pharynx which leads to probable tracheal aspiration and an obstructed airway. There are two ways of putting this type of patient under anesthesia. One is the so-called "crash" technique which simply means that a relatively large dose of intravenous barbiturate and muscle relaxant is given at one injection and an endotracheal tube is quickly inserted. If the tube is inserted into the trachea on the first attempt and before the gastric contents regurgitate into the oral pharynx, all is well. Unfortunately, however, this is not always the case and then usually chaos ensues. The other technique is to spray the oropharynx, epiglottis, and vocal cords with a 0.5 per cent topical anesthetic. This is done with the patient awake, obviously, so that he can cooperate during the act of spraying. The topical anesthetic must never be applied unless there is an intravenous infusion in place and an intravenous soluble barbiturate immediately available. After an adequate topical anesthesia has been established, the endotracheal tube can be inserted with the patient still relatively awake. When the airway is secured, the patient may then be anesthetized. This obviates any possible aspiration of

gastric contents into the trachea, since the patient's reflexes are operative during the spraying. If regurgitation does take place after the endotracheal tube is in place, gastric contents cannot go into the lungs. This, of course, requires considerable gentleness in handling both the laryngoscope and the spray apparatus as well as the insertion of the endotracheal tube. It can be accomplished with a little practice and a little patience. The art of venipuncture is an important and often lifesaving technique. Unfortunately, too many of us are not good venipuncture artists. This is usually upsetting to the patient and causes him to become more apprehensive as each successive vein is punctured without results. One should never use anything less than an 18 G. needle during the course of an anesthetic. The reason for this is that whole blood will not run fast enough through anything less than an 18 G. needle. Before starting an anesthetic, there must be a well-placed intravenous needle in a suitable location, usually one of the upper extremities since it is close to the anesthetist. Too often, in the middle of a surgical procedure when blood is urgently needed, the needle is discovered to be out of the vein, and there is a great flurry of activity in the operating room while someone tries to re-start an intravenous underneath the drapes. At best, this is a miserable situation. One other thing which might be mentioned at this time is that before an anesthetic is started, the anesthetist should be certain that he has all his equipment that he might need, immediately available where he can reach it at a moment's notice. It is most disconcerting to both the surgeon and the anesthetist to discover that he has forgotten a piece of equipment necessary at that moment. This includes, of course, laryngoscope, syringes, needles, muscle relaxants, suction catheter, oral airway, etc.

From the foregoing remarks, I think it is obvious that geriatric anesthesia is not much different from any other type of anesthesia. You must pay attention to the physical condition of the patient, the type of work that he or she has been doing, the state of hydration, and the actual chronological age of the patient. All of these things will dictate the amount of anesthesia and the surgical trauma which that particular patient will withstand. There is no set way to conduct an anesthetic in any patient since each patient dictates from minute to minute what he will tolerate and what he needs. The two most important duties of an anesthetist are constant vigilance and ventilation.

Non-Explosive Techniques of Anesthesia for Infants

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It is frequently necessary to provide anesthesia for patients in locations or in situations where the possibility of electric spark precludes the use of flammable anesthetics. If the patient is an adult or large child, this is today seldom a serious problem because of the common use of intravenous barbiturates, muscle relaxants or spinal, regional or local anesthesia. In the case of infants, however, these types of anesthesia are not commonly used. Ether, cyclopropane, vinyl ether and the like are still the most commonly used agents for patients in the first years of life. However, because of the frequent use of the electrocautery, electronic monitoring devices, photography in the operating room and the large number of diagnostic procedures done in the X-Ray Department, there is a need for non-flammable anesthesia for infants as well as for larger patients. Over the past few years, therefore, we have attempted to work out techniques of non-flammable anesthesia for many surgical and diagnostic procedures in infants. The following is a discussion of some of our experience.

It should be stated at the outset that because these techniques have been used, does not necessarily imply that we believe them always to be the best anesthetic management of these patients. In many cases it has been a matter of necessity rather than choice. We should like to emphasize also that in some situations, ether or cyclopropane continues to be used, if we believe that the advantages of a flammable anesthetic outweigh the possible dangers of fire or explosion.

The Agents and Their Limitations

To begin, it will be well to list some of the agents which are available to us. Table 1 lists the more common ones. Almost without exception every agent listed leaves something to be desired so far as small patients are concerned. Chloroform, for example, although it is a potent non-flammable agent well suited to our purpose, nevertheless requires special equipment for safe administration as well as expert knowledge and experience. It is not commonly used today and many of us could justifiably be criticized for using chloroform for the reasons mentioned.

Spinal anesthesia and some types of regional or local anesthesia — all have a proper place in infant anesthesia. But here again, their use is limited, first by the experience of the anesthetist and second, because unless adequate sedation is used, results

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TABLE I

DRUGS WHICH MAY BE USED FOR NON-FLAMMABLE ANESTHESIA

- CHLOROFORM
- LOCAL AGENTS
- THIOPENTAL AND OTHER BARBITURATES
- MEPERIDINE
- MUSCLE RELAXANTS
- NITROUS OXIDE
- TRICHLORETHYLENE
- FLUOTHANE®

are frequently unsatisfactory because of the inability of the infant to cooperate.

Thiopental and meperidine can be of great value but maximum effectiveness depends on the ready availability of a vein. Venipuncture in the infant is not always easy and can, on occasion, be an insurmountable barrier. The same may be said of the muscle relaxants.

Nitrous oxide and trichlorethylene, when used in safe concentrations either alone or together, provide only light anesthesia and analgesia — a disadvantage which is particularly apparent in the infant because of his high metabolic rate and high degree of reflex irritability. Fluothane,® of all the drugs mentioned, has been the most valuable, although it too has not been the perfect answer to the problem in all cases.

It can be seen, then, that the list is far from perfect. Many of the agents are of limited value, others valuable only to the extent that means can be found to administer them and still others which require special knowledge or equipment.

PREANESTHETIC MEDICATION

The difference between success and failure in the management of this type of anesthesia for infants has in many cases depended on effective preanesthetic medication. In the very small patient we are not interested in "psychic sedation"—this does not become a problem until about one year of age. But we are interested in providing a good foundation of sedation and analgesia, so that the subsequently administered drugs do not have to be "pushed" in order to achieve adequate anesthesia. In this type of anesthesia, the premedication becomes an integral part of the anesthetic itself. This is particularly true in those cases where a vein may not be available for the injection of supplemental drugs either during induction or during the maintenance of anesthesia.

There are numerous ways by which such sedation can be accomplished. One is by rectal instillation of tribromethanol or one of the ultra short-acting barbiturates. Although we use this method in certain situations, we have avoided it as much as possible with infants, because of the lack of controllability and because of occasional prolonged depression. We have had much better success in using and, when indicated, varying the doses from our standard premedication table. (See Table 2.) This table consists of three classes of drugs: an opiate, usually morphine or meperidine; a barbiturate, usually secobarbital; and scopolamine. Dosages may vary considerably depending on the patient, the situation and the agents to be used. The dosages directly from the table are sufficient for most cases. Where we may not be able to supplement the anesthetic by intravenous injection, the dosages may be increased several steps or more. Occasionally, for procedures where little or no general anesthesia is to be used — for local procedures or particularly for cardiac catheter-

TABLE II
CHILDREN'S HOSPITAL OF PITTSBURGH
PREOPERATIVE MEDICATION

AGE	WEIGHT	MORPHINE	SCOPOLAMINE	SECONAL
Newborn (consult anesthetist)				
0- 1 mo.	7- 8 lb.	*gr 1/480	gr 1/800	———
2 mo.	9-10 lb.	*gr 1/320	gr 1/800	———
3 mo.	11-12 lb.	*gr 1/240	gr 1/600	———
4- 5 mo.	13-14 lb.	*gr 1/144	gr 1/600	———
5- 6 mo.	15-16 lb.	*gr 1/112	gr 1/600	gr 1/4
8-11 mo.	17-19 lb.	*gr 1/96	gr 1/600	gr 1/4
12-18 mo.	20-24 lb.	gr 1/72	gr 1/400	gr ss
18-24 mo.	25-27 lb.	gr 1/64	gr 1/400	gr ss

1. Order all 3 drugs at least 1 hour before anesthesia is induced.
2. The doses of morphine and barbiturate are very conservative and may safely be increased several degrees or even doubled if necessary without danger.
3. Scopolamine dosage here is fairly large and should not be increased.
4. Demerol® may be substituted for morphine. Dossage: 1.5 mg/lb. body weight.
5. Rectal administration of barbiturates is not recommended because of poor absorption. If used, double the oral dose.
6. Better sedation is achieved if the barbiturate is given I.M. The affect is more intense, more predictable. Injectable Seconal® dose: approx. 1 mg/lb. Must be given as a separate injection.

*These small doses should not be mixed by the nurse. They are already prepared by the pharmacy. Each dose — 1 c.c.

izations, relatively large doses are used: morphine 0.1 milligram per pound or meperidine 1.5 milligrams per pound plus seconal 1.0 to 1.5 milligrams per pound plus scopolamine.

In our attempts to write effective sedation for children and infants several factors have become apparent. One is that we have tended to err more often by not giving enough rather than too much. An infant or small child is difficult to sedate well. A second factor is that the effect of these drugs is extremely variable in the small patient. The same medication for two children of the same age and weight will frequently be effective for one and not for the other. Or, the same doses will be effective for an infant one time and not another time. We are not prepared to explain this wide variability.

We are convinced, however, in spite of the opinion of several well known authorities, that opiates play an important role in the management of sedation for pediatric patients. The combination of barbiturates with opiates has been the most successful, but we have had very poor results in attempting to use barbiturates alone. We continue to prefer morphine over other opiates except for intravenous use.

Supplementary Medication

On occasion, if the premedication has been inadequate or has worn off or, if repeated doses are needed to supplement either general or local anesthesia, we give one or more additional small doses usually of meperidine or, less often, a barbiturate. Such additional medication is preferably given intravenously.

The supplementation of inhalation or local anesthesia with parenterally administered drugs is, of course, nothing new. It is very common practice in present day adult anesthesia. But with infants, both a technical and a safety hazard exist. To minimize the danger of overdose and to maintain maximum accuracy, we dilute any drugs given intravenously to an infant ten to 20 times before administering them. Meperidine, for instance, is diluted to one or two milligrams per cubic centimeter. We do not inject more than one or two milligrams per minute. Thiopental, though less often used, is diluted to a 0.5 or 1.0 per cent solution. Of the two, as mentioned above, we have found meperidine preferable to a barbiturate for these patients. It provides better analgesia, the infant seems to tolerate it better and there is apparently less cumulative effect than with thiopental or other barbiturates. Furthermore, if overdose should occur, we have effective antidotes in Nalline® or Lorfan®.

A word must be said about the total doses of these drugs. It is obviously impossible to give absolute values. From experience, however, we have learned that little difficulty is encountered if the total supplemental dose of meperidine does not exceed 1.0 to 1.5 milligrams per pound, exclusive of the premedication. Our experience with thiopental is not as great but a total dose of five to ten milligrams per pound is a large dose. Needless to say, the less of any of these drugs given, the better.

On occasion, when no intravenous infusion has been available, we have been forced to seek other routes of administration. Meperidine, of course, is well suited to intramuscular injection, but for our purposes, the intramuscular route is a poor second choice because of the slow onset of action. The addition of 0.1 or 0.2 cubic centimeters of hyaluronidase will, however, appreciably increase the speed of onset of action. Thiopental may also be given intramuscularly. The usual intramuscular dose is six milligrams of a 2.5 to five per cent solution per pound. We have not been impressed with the drug given in this manner, however. The large volume of the injection required presents another deterrent to its use. We have used it chiefly for rapid sedation of infants for stethoscopy or electrocardiography. With rectal thiopental, good basal narcosis can be achieved but the results are unpredictable, and postoperatively, the patient may remain depressed for several hours or more.

It is not the scope of this paper to discuss the use of spinal or regional anesthesia for infants. But conduction techniques are, of course, a means of providing non-flammable anesthesia. One of the major deterrents to their use is the straining and struggling of the infant. By using preanesthetic medication and particularly with the intermittent injection of meperidine intravenously such as we have described above, we have been able to provide a "titratable

sedation" which has been very gratifying to surgeon and anesthetist alike. In so doing, we have greatly increased the scope of conduction anesthesia for even the smallest of our patients.

Inhalation Anesthesia

Although we have said a great deal about drugs used for preanesthetic medication or for supplementation, we consider these drugs simply as adjuncts to inhalation anesthesia, just as they are adjuncts to local or spinal anesthesia. In most cases, the anesthetic itself is built upon nitrous oxide. Aware of its limitations as an anesthetic agent, we attempt to use it as effectively as possible. This is done by using high flows at concentrations as high as are compatible with good oxygenation and the accuracy of our flowmeters. The patient's respiration is vigorously assisted at all times.

Even with maximum use of nitrous oxide, one cannot usually achieve adequate depth of anesthesia for most purposes. The addition of trichlorethylene is helpful but, in many cases, still inadequate. It is for this reason that until recently we have been so dependent upon supplementation with parenteral agents. With the use of Fluothane® our problem has been very greatly simplified. This new drug provides us with good, safe general anesthesia which fulfills most of our needs. Its main disadvantage is the lack of adequate muscular relaxation in some cases. With increasing knowledge and experience, we have been using Fluothane® to a greater and greater degree. It has replaced many of our previous techniques which required supplementation and, in fact, it has replaced ether and cyclopropane in many cases where non-flammable anesthesia was not required.

Muscle Relaxants

The muscle relaxants have been of considerable help in developing nonflammable anesthesia for infants. They have served three functions: (1) to facilitate endotracheal intubation, (2) to provide adequate muscle relaxation and (3) to provide immobility of the patient during anesthesia. There are those who would criticize the use of muscle relaxants simply to keep a patient from moving — something that is properly the function of the anesthetic agents themselves. However, we make no apology for this. The infant has a high degree of reflex irritability and not infrequently, very high concentrations of anesthetic agents are necessary to prevent muscular movement. We have felt that small doses of a muscle relaxant were a smaller price to pay than deep anesthesia.

Our experience has been almost exclusively with succinylcholine. We have been pleased at the manner in which the infant tolerates this drug. By controlling accurately the doses injected and by scrupulously limiting the total dose, we have had virtually no complications. Our standard dose for a single injection has been 0.5 milligrams per pound. This dose will generally produce apnea and very good relaxation for one to three minutes. We have used 0.2 per cent or 0.4 per cent succinylcholine — the same concentration generally used in the "continuous drip" technique. However, we never use the continuous drip for infants. Where multiple doses are required, the dilute succinylcholine is put into a ten or 20 cubic centimeter syringe and injected as necessary.

The use of intramuscular succinylcholine has been of very great value when no vein has been available to us. Our dose for a single injection has been two milligrams per pound—four times the intravenous dose. Onset of action is quite rapid—approximately one minute. The duration of apnea is from three to ten minutes. For multiple doses, we place a needle deep in a large muscle mass and connect a length of plastic tubing from the needle to a syringe of full-strength (20 milligrams per cubic centimeter) of succinylcholine.

On the basis of our experience in very long procedures in older children where massive doses of succinylcholine had been used, and where we had had some trouble with prolonged apneas, we have limited our total dose in infants to no more than ten milligrams per pound. With such a restriction, complications from prolonged apnea have been avoided.

Technique and Equipment

It is axiomatic that the anesthetist should have complete control of the airway and be able to provide adequate ventilation for his patient. This is true of any anesthetic, but particularly with this type of anesthesia, the matter of assistance or control of respiration is of paramount importance. When depressant drugs or muscle relaxants are used, the anesthetist has to be able to do a large part or all of the work of ventilation. This can only be accomplished by the use of a tight fitting mask or by endotracheal intubation.

The wisdom of endotracheal intubation in infants has long been debated. Suffice it to say at this time that the technique can be a safe procedure. In our department we take what may be considered a radical point of view on this subject: we feel that the infant under a year of age who requires anesthesia for a major procedure is, himself, an indication for intubation. This is especially true when techniques and agents such as these are to be used.

What sort of apparatus is connected to the endotracheal tube is of somewhat less importance and is largely a matter of personal preference. A non-rebreathing valve, the Ayre's tube, circle filters designed for infant use, the to-and-fro technique —all can be used satisfactorily so long as the dead space, heat and resistance to breathing are kept to a minimum.

Even with these rigid criteria for intubation, however, not every patient requires an endotracheal tube and even if intubation is to be done, some part of the anesthetic must be given by using a mask. It has been our experience that many otherwise capable anesthetists do not know how to fit a mask on an infant's face to provide adequate exchange.

The infant's head must first be hyperextended upon the neck so that the occiput rests upon the table. The mask is applied lower on the face than in the case of an adult so that the rim hooks over the chin. Firm pressure is applied to the mask upon the face. If sufficient pressure cannot be made with the left hand, additional pressure can be made by resting one's chin upon the mask. Most difficult of all is to learn not to "pull up" on the chin as one does with an adult. In so doing, the infant's lips are compressed and his airway occluded. Mastery of this maneuver is

one of the basic essentials of infant anesthesia.

For induction, maintenance, or for resuscitation, we prefer to use a simple bag and mask. Large flows of gases are used so that there is little or no need for the addition of a soda lime canister. Its presence contributes little but clumsiness and makes the fitting of the mask more difficult. An infant's non-rebreathing mask is sometimes more advantageous if anesthesia must be maintained for any length without an endotracheal tube. The standard Foregger non-rebreathing mask has been modified by adding a finger cap to the exhalation valve to facilitate assistance of respiration.

SUMMARY

An approach to providing anesthesia for infants by non-flammable techniques has been outlined. There are many disadvantages and the result may not always be the best anesthetic for the patient. Such techniques frequently are a necessity, however. Drugs for preanesthetic medication and supplementation, the inhalation agents, particularly nitrous oxide and Fluothane® and the muscle relaxants have been discussed together with their techniques of administration. Emphasis has been placed on the need for a perfectly patent airway and the ability of the anesthetist to assist or control the ventilation.

The Intravenous Use of Anileridine For Minor Surgical Procedures

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Harrisburg, Pennsylvania

Introduction

Seventy-five minor surgical procedures were performed in the Out-Patient Department of the Harrisburg Hospital in which intravenous anileridine was the sole analgesic used with or without a supplementation of nitrous-oxide, oxygen. Thirty-three cases (44%) had nitrous-oxide in conjunction with the anileridine. Seven (9.2%) had succinylcholine or other muscle relaxant. In all cases an antinarcotic was administered intravenously with anileridine. In 65 cases levallorphan was administered with anileridine (87%) and in 10 cases nalorphine was administered with anileridine (13%). The ratio of levallorphan to anileridine was 1 mg. of levallorphan to 25 mg. of anileridine and 5 mg. of nalorphine to 25 mg. of anileridine.

Indications

The indications for the choice of anileridine as an analgesic agent were: (1) The minor nature of the procedures, and (2) the presence of disease or other conditions which would make a general anesthesia difficult or dangerous. Eleven patients (14.6%) had signs of cardio-vascular disease. There was one case of congestive heart failure. Seven patients had arterio-sclerotic heart disease. One patient had complete bundle branch block with bradycardia and two had severe hypertension.

Twenty-three (30.6%) of the patients showed signs of generalized arteriosclerosis and symptoms of cerebral atherosclerosis. Eight (10.6%) of the patients had genito-urinary bleeding which contraindicated local anesthesia and whose poor physical condition made it dangerous to administer general anesthesia. Three patients (4%) showed evidence of upper or lower respiratory tract infection.

Another group of 30 patients (40%) were bleeding following miscarriage or abortion.

Types of Operations

Fifty-five (73.3%) of the procedures performed under anileridine were for genito-urinary conditions. Of this group, there were 37 males and 18 females. Most of these were cystoscopic and retrograde examinations. The majority were in the older age group. Sixteen of the procedures were gynecological or obstetrical and were mainly dilations and evacuations. Three (4%) were procedures performed on the extremities. These consisted of two closed reductions of Colles fractures and one reduction of a dislocated shoulder.

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Dosage

The maximum single dose of anileridine was 25 mg. The minimum single dose of anileridine was 5.3 mg. The average total amount of anileridine used was 24 mgs. The average duration of anesthesia was about twenty minutes.

Complications

The number of complications which occurred with anileridine were fairly frequent, but easily controlled. The most common circulatory complication was hypertension which is probably not due to the action of anileridine, but is probably due to the fact that some discomfort was experienced by the patient.

There were nine cases of hypertension under anileridine in which there was a greater rise than 20 mm. of mercury in blood pressure. Blood pressure returned to normal after surgery. There were three cases of hypotension. The greatest rise in blood pressure was from 130/40 to 210/70. The greatest fall in blood pressure was 150/60 to 100/70. The changes in blood pressure required no treatment other than oxygen. All patients recovered.

There were some respiratory changes. Respirations were slowed in nine cases (20%). No apnea occurred. An increased respiratory rate occurred in eight patients. Again, it is our opinion that increased respiratory rate was a result of surgical manipulation and could not be attributed to the action of anileridine.

Discussion

Some of these patients had discomfort. The addition of nitrous-oxide, oxygen (50-50) was necessary in 44% of the procedures in order to accomplish a reasonable analgesia. The use of levallorphan in the majority of cases does not imply that levallorphan differed in its action from nalorphine. Previous experience with anileridine in doses sufficient to produce analgesia for minor surgical procedures indicated that the addition of levallorphan or nalorphine is necessary to prevent respiratory depression. The advantage of anileridine with an antinarcotic over general anesthesia is that the amnesic-analgesic effects of anileridine are apparently affected very little by the antinarcotic and seemed to produce minimal changes in blood pressure, pulse and respiration in these poor risk patients. Serious respiratory and cardio-vascular depression were conspicuous by their absence. The cardio-vascular and respiratory changes which did occur in this series could be attributed for the most part to reflex changes from the surgical manipulation.

There is no quick antidote for many general anesthetics. The effect of general anesthetic agents may not be quickly and easily dissipated and their toxic signs may be persistent. The effects of anileridine in combination with an antinarcotic can be readily controlled in most instances. Partial or complete amnesia for the procedure was present in the majority of cases.

Conclusion

Anileridine, in combination with an antinarcotic administered intravenously, and in combination with nitrous-oxide, oxygen (50-50) is capable of producing an analgesic—amnesic state in most instances when general anesthesia does not seem feasible or local anesthesia is contraindicated.

(Continued on page 119)

Cardiovascular Collapse During Anesthesia

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Jackson, Mississippi

Severe circulatory derangements occurring during the course of any type of anesthetic procedure can usually be traced to one or more specific etiologic factors. Dripps et al,[1] have listed as the most important causative factors in arterial hypotension the following items: 1. Hypovolemia of chronic or acute nature. 2. Excessive dosages of preanesthetic and/or anesthetic drugs including local anesthetics. 3. Pre-existing cardiovascular, respiratory or general metabolic diseases. 4. Overenthusiastic hyperventilation associated with increased airway resistances. 5. Acute or chronic hypoxia and hypercarbia. 6. Circulatory effects produced by interference with the autonomic nervous system activity such as in spinal or epidural anesthesia, surgical manipulation, sudden changes in the position of a patient, etc. 7. Preanesthetic use of certain phenothiazine derivatives, steroid preparations and Rauwolfia compounds.

Of these etiologic factors, hypovolemia and improper pulmonary ventilation are outstanding and adequate control of these deficiencies will usually minimize adverse effects of the other factors mentioned.

Correction of deficits in fluid and electrolyte, red cell mass and overall circulating blood volume should always receive careful attention in the preoperative period. Unfortunately it is not yet possible or practical in many areas to measure routinely and accurately the total blood volume. Hematocrit, hemoglobin and red blood cell determinations are important studies but many not always reflect the true status of vascular function. It has been shown repeatedly that up to 50% deficits in blood volume may exist in the presence of normal values for the three studies mentioned. Circulatory collapse under the stress imposed by anesthesia and surgery in such situations could well be anticipated. (See Figure 1.)

Another of the common denominators in circulatory collapse under anesthesia is that of respiratory insufficiency. This problem may arise as a result of pre-existing pulmonary disease but all too frequently is the result of complications associated with anesthesia. The more common causes of inadequate pulmonary ventilation during the course of anesthesia are: (1) Airway obstructions including oropharyngeal obstruction, laryngospasm, bronchospasm, aspiration of vomitus and bronchial blockage resulting from malpositioning of endotracheal tubes. (2) Pharmacologic depression of respiration—anesthetic drugs, muscle relaxants. (3) Compromising positions during surgery—lateral decubitus, steep Trendelenburg, etc. (4) High levels of spinal or epidural anesthesia.

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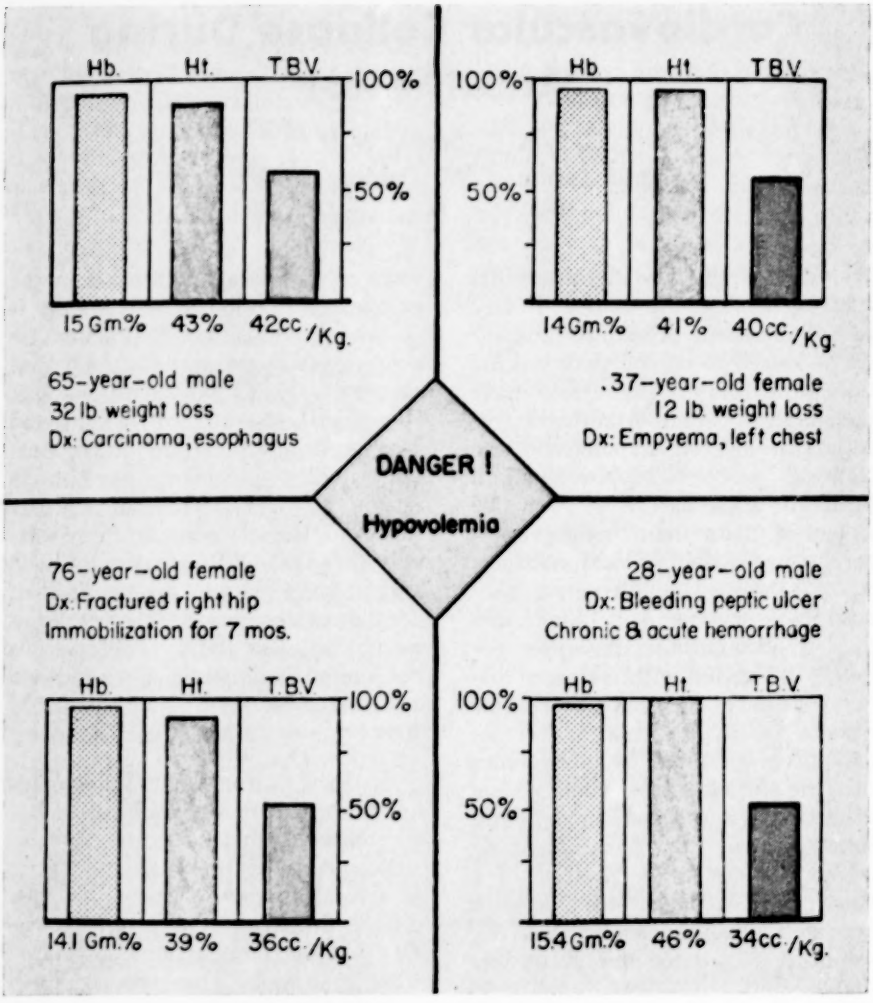

Hb.—Hemoglobin
Ht.—Hematocrit
T.B.V.—Total (Circulating) Blood Volume

Surgical patients with disease states associated with marked weight loss, chronic infection, prolonged immobilization, and blood loss are frequently hypovolemic. The hemoglobin and hematocrit determinations in these patients frequently do not reveal the diminished blood volume and serve only to confuse the surgical team. These patients are prone to sudden cardiovascular collapse following moderate hemorrhage and hypoxia, small quantities of anesthetic agents, and movement on or from the operating table. Proper prevention is based on the measurement and the careful restoration of the total blood volume prior to operative intervention.

Figure 1. Reprinted by permission of the Publishers. (Natof, H. E. and Sadove, M. S., *Cardiovascular Collapse in the Operating Room.* Philadelphia, J. B. Lippincott and Company, 1958.)

As a result of any of the above, severe hypoxia and hypercapnia may occur. If these persist, cardiovascular collapse will follow and indeed in such cases may well be irreversible.

Considerable attention has been given recently to the problem of adrenal insufficiency which has been induced by steroid therapy. The usage of adrenocortical preparations for treatment of various disease entities has reached such magnitude that one should include this possibility in routine preanesthetic questioning of patients. The exact dosage or time required to produce adrenal atrophy is not known and numerous recommendations for control of this problem have been made. In general a patient who has received steroids within six months to one year prior to anesthesia should probably receive booster doses of up to 200 mgm. of cortisone or equivalent in the 24-48 hour period before surgery. Intravenous hydrocortisone should be made available for emergency use.

The treatment of circulatory collapse during anesthesia is directed toward management of the specific problem. Blood loss must be treated by blood replacement in order to maintain an adequate circulating blood volume. Transfusion therapy, however, must always receive careful consideration. Problems of circulatory overload and of blood group incompatibilities constitute no small hazard and in themselves can prove fatal.

Early correction of airway obstructions and the avoidance of deep or extremely light anesthesia are mandatory as preventive measures. In addition, pulmonary hypoventilation induced by anesthetics or muscle relaxant drugs must be managed by instituting assisted or controlled respiration as soon as respiratory inadequacy becomes evident. Compensation for insufficient respiratory exchange induced by operative positions must be provided in a similar manner.

Reflex circulatory phenomena induced by operative positioning or by surgical manipulation of bowel, lung, periosteum or carotid sinus may be controlled usually by intravenous atropine, procaine injection at the involved site and/or small doses of vasopressor drugs.

Absence of a carotid pulsation should be construed as cardiac standstill or ventricular fibrillation and no time should be lost in instituting thoracotomy and pulmonary ventilation with 100% oxygen. If a correct diagnosis has been made, cardiac massage must be started immediately. An incorrect diagnosis in this situation should never warrant criticism.

Techniques to be followed in the management of such cardiac emergencies have been well outlined by a number of authors and all anesthetists and surgeons must be completely familiar with and properly equipped for managing this situation.

Summary

Some of the etiologic factors in cardiovascular collapse during anesthesia have been discussed and emphasis has been placed on hypovolemia and respiratory insufficiency as two of the most common causes. Special emphasis is placed on early recognition and treatment of predisposing factors and on the necessity for speed in management if successful resuscitation is to be expected.

Reference

[1] Dripps, R.D., Eckenhoff, J.E. and Vandam, L.D.: Introduction to Anesthesia. W. B. Saunders and Company. Philadelphia, 1957.

Hospital Safety

Harriet L. Aberg, C.R.N.A.

Question — We have been given to understand that the use of plastic airways is hazardous, because they isolate the patient from the anesthetic apparatus. Can you give us any information in support of this theory?

This member's question was brought for discussion to the last meeting of the National Fire Protection Association's Committee on Hospitals and it seems that the term "plastic airways" covers a multitude of equipment.

It is believed that the use of a pharyngeal tube or airway of plastic carries no particular hazard. The use of plastic and rubber endotracheal tubes in all probability is not hazardous. The surfaces of such equipment readily become moist shortly after being put to use (and such equipment frequently is moistened for lubrication before insertion). Moisture (water) is a ready conductor of electricity.

However, when "plastic airway" refers to a valve, such as the Digby-Leigh, which is inserted into the line, it is possible that it forms a nonconductive area between the patient's tube, airway or mask and the anesthesia apparatus, thus isolating or insulating the patient from the anesthetic apparatus and its breathing tubes. This could be hazardous and provision of some electrical connection between the patient and anesthetic apparatus would be wise.

This is the consensus of those committee members participating in the discussion on the electrical or fire safety of the use of "plastic airways" where flammable anesthetics are being used. Quoting from the minutes of the meeting, "... plastics and particularly the nylon connectors now being used should be replaced with conductive materials."

When these valves, such as the Digby-Leigh, Fink, or Stephen-Slater, are of metal, their insertion into the anesthetic system should present no such hazard.

Items of various types of plastic are being introduced into surgical use. Many of them are disposable, thereby cutting down on maintenance time, providing greater ease of handling, insuring more positive sterilization and better control of possible propagation of infection.

Some of these items introduce an electrostatic hazard which is of interest to anesthetists. One such item is the plastic drape. Potentials of up to 3000 V or more can be generated when placing these drapes on the patient or during other such handling. Investigations have shown that an accumulation of static could not be produced when the plastic drapes were moistened.

Miss Aberg is A.A.N.A.'s representative on the N.F.P.A. Committee on Hospital Operating Rooms.

Any questions pertaining to hospital safety may be directed to the Executive Office. Answers will be included in this section in future issues.

Notes and Case Reports

Neomycin and Apnea

Recently, we at Crawford Long Hospital had the occasion to treat and watch very closely a rather rare reaction of drugs which apparently was completely unknown to practically every member of our staff. This reaction is the effect on respiration of a combination of neomycin sulfate, when placed in the peritoneal cavity, from which it is absorbed rapidly, and relaxant drugs associated with anesthesia.

It has been proven by animal experiments that with high blood levels of neomycin sulfate, particularly during anesthesia with the use of muscle relaxants such as curare or succinylcholine, that the anesthesia has been followed by prolonged and profound respiration depression. Several clinical cases have been reported in which there were human deaths. Extensive animal research was carried out by Pittinger et al.[1] and they definitely established experimentally that the above reaction is a definite hazard. The data reported indicate that neomycin in sufficient dosage produces a non-depolarizing type of neuromuscular blockade which is sufficient to produce apnea or severe respiratory depression. They also demonstrated that the administration of CO_2, lobeline, coramine, metrazol and similar drugs are completely ineffective in relieving the depression. In the experiments, depression was produced by the intraveneous administration of neomycin, whereas the clinical cases of apnea reported were associated with rapid absorption of the drug from the peritoneal cavity. In the clinical cases, ether was the most frequent anesthetic agent used, (seven of eight cases); cyclopropane was the agent in one case and definitely the use of such depolarizing relaxant drugs as succinylcholine sensitized the endplates to the effects of the non-depolarizing relaxant effect of neomycin.

One can speculate on other methods of high blood levels of neomycin, such as the absorption from an inflamed colon which may be encountered in ulcerative colitis; spontaneous rupture of the colon or spillage of colon contents into the peritoneal cavity.

Rapid absorption of the drug from surface wounds, burns, or abscess cavities could happen.

There has been one case reported of a neuromuscular blocking action with the use of streptomycin.[2] This also was substantiated by Pittinger and his co-workers.

Experimentally the marked potentiation of respiratory depression when neuromuscular relaxants are used was proved by the fact that only about 15% blood level of neomycin was required for apnea when used in combination with a neuromuscular paralyzing drug as compared to 62% in cases when neomycin was used alone.

We feel that the clinical cases, although very few in number, substantiated by the extensive laboratory work that has been done, indicates that neuromuscular blocking action of neomycin, especially when potentiated by curare, succinylcholine or ether, should be of definite concern to the anesthetist and the surgeon. The following case definitely falls into the above pattern.

The patient: a white female, age 59, was admitted to Crawford W. Long Hospital in Atlanta, Georgia on November 7, 1958. Her admitting diagnosis was intestinal obstruction. Her past history revealed that in February, 1958, she received treatment for a far advanced state II cancer of the cervix. She received extensive x-ray treatment for this lesion over a period of 85 treatment days. During the course of this treatment it was discovered that she had a lesion of her left breast which proved to be malignant and a radical mastectomy was performed.

On admission to Crawford W. Long Hospital, she had characteristic obstructive symptoms of distension, active peristalsis, pain and x-ray evidence of small and large bowel obstruction. On admission the laboratory work revealed: Hb-12.4 gm. (70%), hematocrit — 40 Vol. %, WBC, 5,400 normal differential. Urinalysis was negative. Pelvic examination revealed malignant or radiation reaction involving the left parametrium. There was no proven evidence of metastasis beyond the pelvis, i.e., lung or liver, and no recurrence of the breast lesion. The abdomen was explored through a left paramedian incision. The pathology was limited to the pelvis and consisted of direct invasion of the sigmoid colon at the pelvic peritoneal floor, this at one time, had produced a spontaneous rupture of the sigmoid with a walled-off abscess area. Into this area a loop of ileum had become attached and became infiltrated with a malignant extension, or marked inflammatory reaction. By extension of the tumor, by radiation reaction, or a combination of them both, a double intestinal obstruction was produced; one at the recto-sigmoid and the other in the twisted and involved loop of ileum.

The patient received morphine gr. 1/6 and atropine gr. 1/150 one hour before anesthesia. The anesthesia consisted of induction with Pentothal® at 10:30 a.m. with a total dosage of 3/4 gm. associated with a total of 5 c.c. of curare and N_2O-O_2 during the entire procedure. Surgery was begun at 10:35 and ended at 12:00. The patient's initial blood pressure was 130/70 which dropped to 110/70 where it remained stable during the surgery. The pulse remained normal. Respiration remained partially apneic and was assisted by the anesthetist. At the termination of the surgery, which consisted of removal of the loop of ileum from the abscess of the ruptured colon, there was considerable unavoidable fecal contamination of the peritoneal cavity. A side-to-side anastamosis of the ileum, bypassing the obstructed area, and a permanent descending colostomy were performed. At the termination of the procedure, because of the contamination by sigmoid content, it was decided by the surgeon to instill 400 c.c. of a 1% solution of neomycin within the peritoneal cavity. Soon after this was done the anesthetist noted that the patient became completely apneic. The surgery was com-

pleted about fifteen minutes later and, since complete apnea was still present, Tensilon®, 2 c.c. was given with no effect. At 12:30, thirty minutes after surgery, the patient showed no response to stimulation and remained in complete apnea. She was moved to the recovery room with positive pressure O_2 being administered at intervals. The pulse was 136 and blood pressure 160/90 at this time. Without positive pressure O_2 the patient would become slightly cyanotic in about three minutes. The course of events was:

1:30—Blood pressure 140/90, pulse 132—pupils widely dilated—no reflexes

2:00—Blood pressure 150/90, pulse 124 — complete flaccid paralysis

2:30—Tensilon® (10 c.c. in 1000 c.c. to V/W) was started

3:00—Resuscitation continued—blood pressure 140/90—pulse 116

3:15—Resuscitation continued—blood pressure 100/70—pulse 132

3:30—Blood pressure 92/60—pulse 120

4:00—Blood pressure 110/70—pulse 112—color good at all times. The vital symptoms remained good except voluntary respiration was absent.

4:30—O_2 continued

5:00—Tensilon® completed — no change in voluntary respiration—total apnea and complete muscular paralysis present—BP 120/70—pulse 108

5:30—Condition unchanged

6:00—Blood pressure 130/80—pulse 108—complete apnea

6:30—Coramine given at request of private physician — no response — blood pressure 110/70—pulse 100—respiration—0

7:00—500 c.c. whole blood given—blood pressure 100/80, pulse 100—complete apnea

7:30—Blood pressure 70/0 — pulse 96—apnea—Wyamine sulfate 1 c.c. given intravenously and 1 c.c. intramuscularly

8:00—Blood pressure 110/90—pulse 120—apnea

9:30—First slight respiratory movements noted. Blood pressure 130/90 — pulse 128. Voluntary respiratory motion would come in cycles lasting two to three minutes with intervals of apnea about fifteen minutes in between at this stage. No movement noted, pupils dilated with no reflex activity. Blood pressure stable and pulse about 110 to 120. The patient's nailbeds have remained pink during time of assisted respiration.

10:00—It was felt that the patient was completely conscious and at intervals she was asked to move her fingers and at this time a very slight movement of the index finger of the left hand was accomplished on request.

10:15—Adequate cycles of respiration, pulse and blood pressure varying about every ten to fifteen minutes from normal to complete apnea during this stage. When apneic cycle was present, the blood pressure would fall to about 90/60 with a pulse of over 120. With voluntary breathing the blood pressure and pulse were nearer normal.

10:30—Patient would open and close eyes following vocal stimulation. Closing the lids seemed much more difficult than opening of the lids. Blood pressure 90/80—pulse 110.

11:00—Respiration adequate about seventy-five per cent of time. Patient still has cycles of increased and decreased vital symptoms.

11:30—Patient continued to improve with less assistance required. Patient talked for the first time at this point.

12:00—General condition good. Patient alert and cooperative. No respiratory assistance needed. Blood pressure 100/80—pulse 114, respiration adequate. After this hour the patient had no further respiratory difficulties, and vital signs remained stable throughout the remaining postoperative course.

In questioning the patient later about the period from 12:00 noon until 12:00 o'clock midnight, she remembered most of the afternoon but could not move or breathe. However, to our surprise the experience of not being able to breathe was not unpleasant. The patient complained of intense pain in the area of the incision but was very comfortable otherwise. She remembered specific circumstances and words spoken by those around her from about 3:00 p.m. to midnight. She remembered seeing people who came within her range of vision when her eyes were normally opened and vividly remembered the pain. The fact that this conscious state was present was recognized early and care was taken as to what was said during the apneic interval with efforts to encourage the patient. Apparently she had no adverse effects from the experience, however, we don't want it to happen to us again.

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[1] Pittinger, C. B.; Long, J. P. and Miller, J. R.: The Neuromuscular Blocking Action of Neomycin: a concern of the anesthesiologist. Anesth. & Analg. *37*:276-282, Sept.-Oct. 1958.

[2] Brazil, O. V. and Corrado, A. P.: The Curariform Action of Streptomycin. J. Pharmacol. & Exper. Therap. *120*:452, Aug. 1957.

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EXAMINATION

The THIRTY-SECOND QUALIFYING EXAMINATION for membership in the American Association of Nurse Anesthetists will be conducted on November 12, 1960. The deadline for accepting completed applications including the transcripts is October 1. Notice of eligibility will be mailed about October 10. Applications should be forwarded early enough to allow time to request transcripts and have them returned to the Executive Office before the deadline date.

Insurance

Unemployment Insurance

A member of the A.A.N.A. wrote to us recently and asked if we sold "Unemployment Insurance." In my reply I explained that we sold only the plans authorized by the A.A.N.A. and that Unemployment Insurance was not included in the approved programs.

This thought occurred to me later. The member who inquired about "Unemployment Insurance" had a better understanding of the A.A.N.A. Insurance Program than I did.

Unemployment Insurance is paid to people who are out of work. It is a welfare fund, supported financially through taxes. However, Unemployment Insurance could be any type of insurance that offers financial aid during a term of unemployment.

Take for instance the A.A.N.A. "Income Protection Plan." This is really Unemployment Insurance too. It provides an income when a member is unemployed because of a sickness or accident. This type of Unemployment Insurance will pay benefits for a year for any sickness and life-time benefits for an accident. After six months this plan continues to pay full benefits without the payment of any further premiums. It also pays benefits from an accident even if the member is only working part-time. The Income Protection Plan is truly an excellent "Unemployment Insurance" program.

A member is also unemployed if confined to a hospital. The Income Protection Plan will offer financial help because of the loss of pay—but, how about the large hospital bills? This is the reason for the Major Hospital Group Plan. The unemployed member now has provided two sources of additional income; the Income Protection Plan or Salary Continuation Plan and the Major Hospital Reimbursement Plan.

Compulsory Unemployment is caused by old age or death. To be unemployed through sickness or accident is generally temporary unemployment. Age forces the member into a permanent compulsory unemployment status. Unless the member provides for this day of Compulsory Unemployment, it could be a long sad period of want. The time to prepare for this phase of our lives, politely referred to as retirement, is *now*. The A.A.N.A. Group Retirement Plan is one of the safest answers to this permanent compulsory term of unemployment.

I appreciated the letter from the member. Her new approach to an old problem could give us all a better appreciation of the need for the various A.A.N.A. Group Insurance Programs. "Unemployment Insurance" is definitly a part of the A.A.N.A. Group Insurance plans.

John C. Mogensen

Insurance Consultant

"UNEMPLOYMENT INSURANCE" Available Through AANA Approved Group Insurance Programs

Protect your salary —

(1) Against loss of income caused by unemployment due to sickness or accident.

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Book Reviews

A SYNOPSIS OF ANAESTHESIA. By J. Alfred Lee, M.R.C.S., L.R.C.P., M.M.S.A., F.F.A.R.C.S., D. A., Senior Consultant Anaesthetist to the Southend-on-Sea Hospital, etc. The Williams & Wilkins Co., Baltimore. Cloth. 616 pages, 72 illustrations. 4th ed., 1959. $6.50.

This excellent handbook has been expanded for its fourth edition to more than twice its original size. It now includes the more recent technics of administration and the newer agents both in pre-anesthesia care and for use during anesthesia. Although the discussion of apparatus is primarily of equipment used in Great Britain, anesthetists in the United States will find this edition even more helpful than past editions. It could be used particularly well in review of the entire subjects of pre- and post-anesthesia care as well as the actual technics of administration.

A PRACTICE OF ANAESTHESIA. By W. D. Wylie, M.A., M.B. (Contab.), M.R.C.P., F.F.A.R.C.S., Consultant Anaesthetist, St. Thomas's Hospital, The National Hospital for Nervous Diseases, and The Royal Masonic Hospital, London, and H. C. Churchill-Davidson, M.A., M.D. (Contab.), F.F.A.R.C.S., Consultant Anaesthetist, St. Thomas's Hospital, The Chelsea Hospital for Women, and The Brompton Hospital, London. The Year Book Publishers, Inc., Chicago. Cloth. 1056 pages, 246 illustrations, 1960. $20.00.

The authors have attempted to gather "within the covers of one volume the greater part of that widely scattered knowledge which the anaesthetist of today is expected to possess." Touching briefly on the pertinent phases of anatomy, physiology, physics and pathology, the authors will take the reader through an entire course in anesthesia. Utilizing the talents of contributors on special subjects a tremendous amount of information has been incorporated in the text. Each chapter is followed by an extensive list of references pertaining to the material. Cross references to other parts of the book have reduced the repetition that could have occurred in so ambitious an undertaking. It is concisely indexed and illustrations are pertinent without crowding the text.

CARE OF THE SURGICAL PATIENT. By Shirley Graffam, R.N., B.S., Formerly, Instructor of Surgical Nursing, University of Illinois College of Nursing, Chicago, Illinois. McGraw-Hill Book Co., Inc., New York. Cloth. 311 pages, 55 illustrations. 1960. $6.00.

This text is written for students who are learning the basic principles of surgical nursing with the various implications of this branch of nursing. This book may be found useful in teaching student nurse anesthetists. However, the references to anesthesia are somewhat limited. For example, the statement "Local anesthesia, either regional or spinal, has the advantage of producing no excitement stage or vomiting in the recovery period," does not strictly state the facts. Some of the drawings and information concerning preparation for the various types of surgery may be found useful by students in anesthesia.

(More Reviews on page 119)

Legislation

Emanuel Hayt, LLB., Counsel A.A.N.A.

Failure of Surgeon to Advise Patient of Sponge in Abdominal Cavity Postpones Statute of Limitations

On April 20, 1948, the plaintiff in this case, Chester A. Ayers, underwent, in the Wilkes-Barre General Hospital, an operation for a marginal jejunal ulcer. He was discharged from the hospital on May 4, 1948, but the operation did not afford him the relief he had anticipated. On the contrary, he experienced pains in his abdomen which continued for several years. On January 3, 1957, he returned to the hospital for a series of tests, hoping that science might discover the cause of his unceasing discomfort. It did. At the spot which seemed to him to be the fountainhead of his suffering and misery, there was found a foreign substance, that is, a sponge. It had been left there by the surgeon, Dr. Philip J. Morgan, who had performed the operation nine years before.

Ayers sued Dr. Morgan in trespass, charging him with negligence in that, having opened him up to remove an ulcer, he then sealed the aperture without first removing a metallic gauze sponge which had been used in the surgery. (1) The defendant filed an Answer denying the charge of negligence and then asked for judgment, raising the affirmative defense of the bar of the Statute of Limitations.

The plaintiff contends that the Statute of Limitations could not take effect until it became a matter of knowledge to him that the surgeon had buried a sponge in his entrails. This he did not learn until January 3, 1957. Was the running of the statute, in view of the circumstances related, tolled until that date? The partinent feature of the statute reads:

"Every suit hereafter brought to recover damages for injury wrongfully done to the person, in case where the injury does not result in death, must be brought within two years from the time when the injury was done and not afterwards . . ."

Thus, in the instant case, the negligence charged was not the use of a sponge but the failure to remove it at the proper time. Surgeons employ all manner of implements in performing their magic of restoring health and well-being to ailing humanity. Able, solicitous and evercaring as Nature is in rebuilding broken bones, restoring wrecked tissue, and rehabilitating flaccid muscles, the expert hand of the surgeon guides the restorative procedure and, in doing so, he often must use such things as nails, screws, sponges, metallic clips and rubber tubes. If he overlooks removing the nails, unscrewing the screws, taking out the clips, withdrawing the sponges and extracting the tubes, his negligence dates from the time the extraneous item was to have been removed and continues throughout

the period he fails to perform his obvious duty. An operation is not completed until the surgeon takes away the tools with which he operates.

"Our conclusion is, therefore, the appellee's acts of leaving the ball of gauze in appellant's abdominal cavity and his failure to apprise appellant thereof were such fraudulent concealments and continuing acts of negligence as toll the statute of limitations until appellee performed his duty of removing the foreign substance or appellant learned or should have learned of its presence."

If, as Mr. Ayers charges in his Complaint, Dr. Morgan deposited a sponge in his body and failed to remove it in therapeutically good time and, because of the nature of the concealment, the plaintiff was unable to learn of the hidden sponge until after the two year period had expired, he is entitled to proceed with his action.

The judgment of the Court below was reversed and a new trial ordered.

(Ayers v. Morgan, 10 CCH Neg. Cases 2d 119-Pa.)

(Continued from page 106)

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(Continued from page 117)

Hospital Trusteeship. By Charles U. Letourneau, B.A., M.D., C.M., B.C.L., M.S.H.A., F.A.C.H.A., Counsellor and Advisor to Hospitals, Director, Program in Hospital Administration, Northwestern University, Editorial Director of Hospital Management magazine. Starling Publications, Chicago. Cloth. 480 pages. 1959.

Although the title of this book would not seem to be one that would attract the nurse anesthetist, there is a tremendous amount of information incorporated in this volume that will help nurse anesthetists in a better understanding of the hospital organization and the responsibilities of the trustees. The qualifications for trusteeship could well serve as a pattern for hospital employees. We would recommend this book to nurse anesthetists who are seeking to improve their understanding of the function of the hospital.

Clinical Applications of Diagnostic and Therapeutic Nerve Blocks. By John J. Bonica, M.D., Director, Department of Anesthesiology, Tacoma General Hospital and Mountain View General Hospital; Senior Consultant in Anesthesiology, Madigan Army Hospital and Veterans Administration Hospital, Tacoma, Washington; Associate in Anatomy and Consultant to the Department of Anesthesiology, University of Washington School of Medicine, Seattle, Washington. Charles C Thomas, Springfield, Illinois. Cloth. 354 pages, 45 illustrations. 1959. $8.75.

With the increasing use of diagnostic and therapeutic nerve blocks the nurse anesthetist will be better informed and able to assist with these procedures by studying this book. In some specific instances there will be more than casual interest. The application of therapeutic technics to the relief of postoperative pain and the clinical application of nerve block in the management of disease are among the many interesting subjects.

Abstracts

Botterell, E. H.: Lougheed, W. M., Morley, T. P. and Vandewater, S. L.: Hypothermia in the surgical treatment of ruptured intracranial aneurysms. J. Neurosurg. 15: 4-18 (Jan.) 1958.

"Hypothermic anaesthesia for cerebrovascular surgery was begun in the Toronto General Hospital in the summer of 1954. . . . Following hemorrhage, 73 patients with ruptured berry aneurysms have had the aneurysm operated on using hypothermia, and common carotid and vertebral arteries were occluded as necessary. There were 17 deaths, and of the 56 survivors, 50 were excellent or good results and 6 were bad or fair. One death occurred when 1 week had elapsed between hemorrhage and operation. Forty-four patients were operated on under 7 days with 16 deaths. The results of operation in the first 7 days following hemorrhage vary according to (a) the site of the aneurysm, (b) the extent of brain injury from hemorrhage or ischemic softening, (c) the presence or absence of a large haematoma, and (d) the physiological age of the patient. . . .

"We believe that hypothermia and cervical arterial occlusion as required have improved our surgical treatment of ruptured aneurysms. Carotid angiography should be performed as early following a subarachnoid hemorrhage as is judged practicable, followed by decision regarding operation. Our experience indicates that early operation is of great value in cases of middle cerebral aneurysms with large intracranial clots. . . . Improvement in the outlook of patients with a ruptured aneurysm requires further research, refinement of angiography, anaesthesia and surgery. Arterial spasm is a major problem in the acute cases. Surgical treatment, if it is to reduce the mortality, must follow early upon hemorrhage before the development of irreversible brain injury."

Richards, R. K.: Analeptics: pharmacologic background and clinical use in barbiturate poisoning. Neurology 9: 228-233 (April) 1959.

"The meaning of 'analeptic' is defined here as a drug which restores depressed medullary and cerebral function and removes the consequences of such depression. . . . In our discussion of the antagonism between barbiturates and analeptics, we can safely concentrate on a few drugs — pentylenetetrazol (Metrazol), picrotoxin, and bemegride (Megimide). In addition to these drugs, whose clinical-pharmacologic effect is essentially confined to the central nervous system, certain drugs are of importance that are central stimulants as well as sympathomimetics: dextroamphetamine (Dexedrine), d-desoxyephedrine (Desoxyn, Methedrine, and so on) and methylphenidate (Ritalin). Clinical experience and fairly extensive pharmacologic studies indicate that drugs like caffeine, strychnine, camphor, nikethamide (Cor-

amine), and certain others are probably of little, if any, antagonistic value in the treatment of severe barbiturate depression. . . .

"The low organ toxicity of picrotoxin and Metrazol is truly astounding. Doses as high as 14 gm. of picrotoxin or 17 gm.—and even 25.9 gm. —of Metrazol have been successfully given for a few days to patients with barbiturate intoxication without producing sequelae. Present indications are that Megimide will have the same properties. Who will seriously deny that we render a service to a patient by reducing the period of deep coma from several days to a few hours? . . .

"Certain of the sympathomimetic amines have found some favor in the treatment of barbiturate poisoning. While these drugs have considerable analeptic potency, their stimulating effect upon the circulatory system, especially with high and repeated doses, sympathomimetic amines may have a depressant component. In our experience, moderate amounts of these drugs are useful in restoring a drop in blood pressure. However, in severe vascular collapse, plasma expanders and drugs like Neo-Synephrine or norepinephrine (Levophed) must be used; these, in turn, are free of central stimulating action. However, no specific antagonist against barbiturates or other hypnotics exist. Probably, the range of usefulness of potent analeptics will also apply more or less to the new nonbarbiturate hypnotics such as Doriden, Noludar, Valmid, and Placidyl. More recently, analeptic drugs have been tried as a means to awaken patients from barbiturate anesthesia or to shorten recovery. . . .

"The results are not uniform, and the usefulness of this procedure is not yet definitely established."

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NURSE ANESTHETIST: 240 bed hospital 60 miles East of Pittsburgh. Start $5460 - $6000 based on experience. Anesthesiologist in charge. Excellent policies including a retirement program & life insurance benefits. Contact: Personnel Director, Mercy Hospital, Johnstown, Pa.

NURSE ANESTHETISTS to complete staff of three for 85 adult bed hospital. Situated midway on Pennsylvania Turnpike between Pittsburgh and Harrisburg. Famous Resort Area. Salary open, liberal Personnel Policies — Apply Miss M. Valigorsky, C.R.N.A., Memorial Hospital of Bedford County or telephone Collect — Bedford 655. Route 1, Everett, Pa.

WANTED: Nurse Anesthetist in a 110 bed General Hospital in beautiful Vermont town of 10,000 close to excellent ski areas. No Neuro or Heart Surgery. Approximately 1200 Surgical and 500 Obstetrical Anesthetics yearly. Department headed by Board Certified Anesthesiologist. One Nurse Anesthetist now; second needed. Excellent working conditions. Salary open. Contact F. L. Herrick, M.D., Director of Anesthesiology, Henry W. Putnam Memorial Hospital, Bennington, Vt.

WANTED — 2 NURSE ANESTHETISTS to complete staff of seven. No night call. No OB. Above average salary for area. Liberal vacation and sick leave plus choice of two pension plans. 335 bed County & Private Hospital. Apply to Personnel Manager, Duval Medical Center, 2000 Jefferson St., Jacksonville 8, Fla.

REGISTERED NURSE ANESTHETISTS: Immediate openings for permanent employment. 670 bed hospital. Exceptional opportunity for well trained Nurse Anesthetist in active operating room suite. Apply: Personnel Director, Harper Hospital, Detroit 1, Michigan.

NURSE ANESTHETIST — 154 bed hospital—suburban community North of Chicago on Lake Michigan's beautiful shoreline. New surgery and other facilities recently constructed. Department of four Nurse Anesthetists under an M.D. Anesthetist. Salary open depending upon qualifications. Merit increases. Excellent living facilities. For further details write Personnel Director, Highland Park Hospital Foundation, Highland Park, Illinois.

NURSE ANESTHETIST—$500. New and Modern Surgery: unusually strong and well diversified Surgical Staff. Good opportunity in new 260-bed expanding hospital; college town location; good personnel policies; 40-hour week; 7 holidays, hospitalization. Social Security. Apply: F. J. O'Brien, Administrator, Chambersburg Hospital, Chambersburg, Pa.

NURSE ANESTHETISTS (4) — To increase present staff. Accredited 500 bed hospital in University town. Excellent salary; liberal Personnel Policies. Write Administrator, St. Joseph Mercy Hospital, Ann Arbor, Michigan.

ANESTHETIST—330 bed voluntary general hospital—not tax supported. Modern air-conditioned surgical suite. Excellent working conditions. Room and board available if desired. Staff consists of 6 nurse anesthetists under supervision of 3 anesthesiologists. Salary open. Apply Decatur and Macon County Hospital, Decatur, Illinois.

ANESTHETIST—A.A.N.A. member, for 325 bed hospital 16 miles West of Chicago's Loop. Excellent salary. 4 weeks vacation, paid life insurance, Blue Cross available, sick leave, paid holidays and other liberal benefits. Alternate call duty with five other Anesthetists. Emergency OB call only, with fee for OB call. Apply Personnel Director, Memorial Hospital, Elmhurst, Illinois.

NURSE ANESTHETIST — For 120 bed Community Hospital in Western North Carolina to work with other Nurse Anesthetists. Hospital fully approved by JCAH; excellent salary; liberal Personnel Policies. Write Administrator, Grace Hospital, Inc., Box 150, Morganton, North Carolina.

OPENING available Oct. 1960 (for Nurse Anesthetist) for 30 bed hospital in small Northeastern Oregon community. Low surgical volume and no OB allows time for personal activities or other hospital duties with additional pay. This is an ideal situation for a married woman or an older person wanting to slow down or avoid heavy work schedules. 3 weeks vacation. Salary open. Apply Administrator, WALLOWA MEMORIAL HOSPITAL, Enterprise, Oregon.

NURSE ANESTHETIST. 267 bed hospital situated on Lake Michigan, 40 miles north of Chicago. New air-conditioned department. Six Nurse Anesthetists. Contact Mrs. Helen E. Sylvester, Administrator, Victory Memorial Hospital, Waukegan, Illinois.

OPENING for 2 Registered Nurse Anesthetists. University City, population 100,000. New 175 bed hospital, 2 M.D. Anesthesiologists and 4 R.N.A.'s now in department. Busy OB and Surgery. Day off after call. Must be energetic and willing to adopt new methods. Sick leave. 2 weeks vacation to start. Retirement plan and other benefits. Congenial working conditions. Begin $500 per month. Contact either Dr. Francis or Miss Chasteen, R.N.A., Central Baptist Hospital, Lexington, Kentucky.

NURSE ANESTHETISTS for 220 bed community hospital. Working with private group. Two full time M.D.'s, four nurses, all agents and techniques. Modernization program going on. Two and one-half hours from Boston and New York. Write G. J. Carroll, M.D., William W. Backus Hospital, Norwich, Connecticut.

NURSE ANESTHETIST: 364 bed General Hospital being enlarged to 500 beds. Want to enlarge present staff of one M.D. plus 7 Anesthetists. Salary from $400 to $500 per month, plus extra bonus payment per case on call duty and retirement and sickness benefits. New air conditioned Operating Rooms. Apply Chief, Department of Anesthesia, York Hospital, York, Pa.

REFRESHER COURSE for Nurse Anesthetists; All agents, drugs and techniques used. Duration of Course from three to six months depending on need of individual. For information write Virginia L. DeMaio, C.R.N.A., Director, School of Anesthesia, The Memorial Hospital, Danville, Virginia.

Applications being accepted for expanding Anesthesia Department in large Catholic Hospital in Metropolitan Chicago. Liberal Personnel Policies—pension plan, credit union, automatic salary increases. Other Nurse Anesthetists employed. Reply: Box B-42, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST for 604 bed General Hospital. No Pediatric Department. 40 hour week, plus overtime, 3-11 shift. Salary open, generous employee benefits. Apply Personnel Office, Akron City Hospital, 525 E. Market St., Akron 9, Ohio.

WANTED: Nurse Anesthetist for 38 bed Hospital. Administer all Anesthesia including OB cases. With exception of emergencies and OB cases all cases scheduled during normal duty hours. Group Hospitalization and Medical Insurance available. Two weeks paid vacation per year. Meals furnished while on duty status. Salary open for discussion. Contact: Administrator, Annie Jeffrey Memorial County Hospital, Osceola, Nebraska.

ONE ANESTHETIST NEEDED to complete a staff of seven. For information contact Chief Anesthetist, Baptist Hospital, Pensacola, Fla.

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County of Hawaii
Hilo, Hawaii.

NURSE ANESTHETIST: for accredited 393 bed General Hospital. 40 hour week. No call. Top salary. Liberal vacation, sick leave, other benefits. Quarters, laundry and maintenance available. Write Personnel Director, Miller Hospital, St. Paul, Minn.

ONE NURSE ANESTHETIST desired — CRNA preferred, to increase present staff surgery. No OB call. Expanding OR Suite. Midwestern Town. Salary depending on qualifications. Write Administrator, St. Mary's Hospital, Galesburg, Ill.

NURSE ANESTHETIST for fully accredited 160 bed hospital in beautiful Northern Michigan. Member or eligible for AANA. Salary — begin new graduate at $500 per month — open for experienced anesthetist. Five day week. annual vacation and sick leave, Social Security, group life insurance and partially paid Blue Cross. Apply: A. J. Hegener, M.D., Little Traverse Hospital, Petoskey, Mich.

NURSE ANESTHETISTS—500 bed General Community Hospital. New and remodeled modern Surgical Suite, no OB, $500 - $550 per month to start, liberal benefits, College Town, excellent location. Write or call Administrator, Spartanburg General Hospital, Spartanburg, S. C.

NURSE ANESTHETIST — for 200 bed fully accredited General Hospital in Baltimore—expansion program now going on — attractive salary arrangements. Liberal fringe benefits of holidays, sick leave, and vacation. Reply Box B-43, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

WANTED: Nurse Anesthetist for 150 bed hospital. Starting salary $6300 plus complete maintenance. 2 Nurse Anesthetists in department. College Town. Excellent Personnel Policies. Apply: J. W. Kenney, Administrator, Mary Lanning Memorial Hospital, Hastings, Nebraska.

NURSE ANESTHETIST — Immediate opening for well qualified Registered Anesthetist in 150 bed fully approved hospital located in beautiful State Capital and University City of 125,000, liberal Personnel Policies. For further information contact Administrator, Methodist Hospital, Madison, Wisconsin.

WANTED: NURSE ANESTHETIST. Large Chicago Hospital. Opportunity to earn up to $650 per month. Laundry provided. Liberal vacation. Housing available at nominal cost. Write: Personnel Department, Michael Reese Hospital, 29th and Ellis Ave., Chicago 16, Ill.

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2 NURSE ANESTHETISTS. 275 bed hospital. Start $500.00 per month and maintenance. Emergency call every 5th day. Department directed by Anesthesiologists. Apply St. Frances Hospital, Monroe, La.

ANESTHETISTS: Immediate openings in a chain of ten General Hospitals located in the coal mining communities of Eastern Kentucky, Southwestern Virginia, and Southern West Virginia. Salary at the rate of $5880 or $7080 per annum, depending upon background and experience, annual increments, 4 weeks paid vacation, 7 paid holidays, sick leave, non-contributory retirement plan plus Social Security. Write to: MINERS MEMORIAL HOSPITAL ASSOCIATION, Box No. 61, Williamson, W. Va.

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ANESTHETIST for 100 bed fully accredited Pediatric Hospital located in a new progressing Children's Medical Center. Salary commensurate with training and experience. Excellent Personnel Policies and pleasant working conditions. Address inquiries to Dr. Dean C. Watland, Director of Department of Anesthesiology, Children's Memorial Hospital, 44th and Dewey Ave., Omaha, Nebraska.

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NURSE ANESTHETIST — Immediate opening for qualified Registered Nurse in 444 bed short term General Hospital with active Surgical Program. Opportunity to associate with three Board Certified Anesthesiologists. Salary commensurate with experience and training. Extra work available if interested. Write furnishing outline of experience to Director of Anesthesia, Delaware Hospital, 501 W. 14th St., Wilmington 99, Delaware.

POSITION OPEN for A.A.N.A. member to maintain present staff of four. Large University Hospital, excellent staff, with wide variety of surgical cases, including Thoracic and Cardiac Surgery. Two weeks paid vacation, twelve days sick leave, six paid holidays and insurance benefits if desired. Salary dependent upon experience, plus compensation for call time. Contact Miss Ramona Kersey, Chief Nurse Anesthetist, Firmin Desloge Hospital, St. Louis, Mo.

ANESTHETISTS: Charleroi-Monessen Hospital (general, 199 beds and 36 bassinets), North Charleroi, Pa. (HU 3-5561). Salary $475 - $550 with increments, sick leave, holidays, month paid vacation annually, Social Security, etc. Call or write Administrator.

NURSE ANESTHETIST—The Chicago Lying-in Hospital of the University of Chicago, day duty, 8:00 a.m. - 4:00 p.m. No call — excellent fringe benefits — salary open. For further information contact Dr. P. Ouda Olson, 5841 Maryland Ave., Chicago 37, Ill.

NURSE ANESTHETIST: Immediate opening in 102 bed hospital. Salary open with laundry of uniforms included. Three weeks vacation after first year, four week vacation each year thereafter. Sick leave and holidays. No OB call. Operating suite 5 years old. For further information please contact: G. W. Berndt, Director of Anesthesia, Dodge County Community Hospital, Fremont, Nebraska.

WANTED: Nurse Anesthetists for University Hospitals. Good salary, vacation and working conditions. Opportunities provided for working toward university degree. Department under direction of M.D. Anesthesiologist. Apply Robert A. Hingson, M.D. Director of Anesthesia, University Hospitals of Cleveland, 2065 Adelbert Rd., Cleveland 6, Ohio.

NURSE ANESTHETIST, Male or Female, for hospital on Staten Island, N. Y., excellent conditions. Write Box B-44, Journal American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Ill.

NURSE ANESTHETIST to complete staff of five for 268 adult bed hospital, expanding to 500 soon, located near business district, Akron, Ohio. Surgery and OB. No call except relief. Forty hour week, extra for overtime. Four weeks vacation after year. Base pay after Boards $425.00, qualifications and experience govern salary offer. Apply: Administrator, St. Thomas Hospital, 444 N. Main St., Akron 10, Ohio.

AN OPPORTUNITY in anesthesia is available in a progressive hospital with a top-flight Surgical and Obstetrical Staff. This is for the Nurse Anesthetist who wishes to work in the best professional environment under excellent working conditions. For details of this position contact: E. H. Prescott, Administrator, Pottstown Hospital, Pottstown, Pa.

WANTED: Nurse Anesthetist, expansion program to enlarge department in the very near future. Salary open. Experience preferred. Contact hospital by writing. Administrator, St. Mary's Hospital, Orange, N. J.

NURSE ANESTHETIST: Wanted for 57 bed hospital. Two anesthetists employed. Salary open. Details on request. Contact: Administrator, Sid Peterson Memorial Hospital, Kerrville, Texas.

NURSE ANESTHETIST — 225 bed General Hospital, suburban Detroit area. Salary $480.00 per month, with increases to $524.00. Blue Cross - Blue Shield, Social Security, retirement plan, group insurance available. Reasonable living accommodations available. Apply:
Administrator
Wyandotte General Hospital
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NURSE ANESTHETISTS—for City Hospital, a 1000 bed General Hospital under the City of St. Louis. Salary range is $464 to $564 per month. Three weeks vacation. Eleven paid holidays. Sick leave benefits. Write to Department of Personnel, City of St. Louis, 235 Municipal Courts Bldg., St. Louis 3, Missouri.

NURSE ANESTHETIST for fully accredited, 140 bed hospital in Southwest Virginia. Air conditioned Operating Rooms. Standard Personnel Policies and Social Security benefits. Salary $425.00, adjusted to experience, and maintenance allowance. C. B. Hale, Administrator, Johnston Memorial Hospital, Abingdon, Va.

ANESTHETIST - NURSE: Immediate opening in a 300 bed, fully accredited, General Hospital located in a city of 55,000 population. Exceptional salary, quarters furnished while on duty, liberal Personnel Policies. Apply Assistant Director, Lima Memorial Hospital, Lima, Ohio.

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NURSE ANESTHETIST — 325 bed General Hospital — Surgical Service only. Excellent salary—call time paid at rate time and ½ and double time, for Sundays and Holidays. Retirement policy, hospitalization — paid vacation, sick leave. Reply: Director's Office, Highland Park General Hospital, Highland Park, Mich.

NURSE ANESTHETIST: for part time. Very few night calls, small OB Service; all types of inhalation anesthesia. 50 bed hospital, Valley of Virginia. Apartment available. Attractive for semi-retired CRNA. Apply Berdena M. Morey, C.R.N.A., Shenandoah County Memorial Hospital, Woodstock, Virginia.

NURSE ANESTHETIST: 200 bed fully accredited private General Hospital. Two full time Anesthesiologists. Salary open but not lower than $500 per month. Liberal employee benefits. Send resume of age, education, experience and salary expected to Sister Rene, Administrator, St. Joseph's Hospital, Alton, Ill.

POSITIONS WANTED: 2 male A.A.N.A. members available. Both married with families. 14 years experience in all types of gas, I.V. anesthesia and intubation. Free lance preferred. Write to Box B-45, Journal of the American Association of Nurse Anesthetists, Prudential Plaza, Suite 3010, Chicago 1, Illinois.

NURSE ANESTHETIST — Immediate opening. $500.00 per month. Luther Hospital (250 bed), Anesthesia Department, Eau Claire, Wisconsin (Population 40,000).

NURSE ANESTHETIST: 525 bed hospital. Good salary and working conditions. Air conditioned operating rooms. All agents and techniques used. 10 full time anesthetists. Rotating call every 7th night, with day off following call. Contact Mildred H. Hodges, C.R.N.A., Missouri Baptist Hospital, 919 North Taylor, St. Louis 8, Missouri. JE 5-6000.

NURSE ANESTHETIST for 275 bed hospital. Operating Room and Obstetrical Anesthesia. Excellent working conditions and personnel policies. Diversified and congenial surgical staff. Good salary — compensation for overtime and call duty. Apply: Dr. Van Kirk, St. John's General Hospital, 3339 McClure Avenue, Pittsburgh 12, Pennsylvania.

WANTED: Nurse Anesthetist. 40-bed private pediatric hospital. Salary open depending on qualifications. If interested please write stating qualifications and experience to Floyd S. Kaplan, Administrator, Tepper Hospital, Chattanooga 7, Tennessee.

NURSE ANESTHETIST wanted on beautiful Gulf Coast of Mississippi. New 120 bed completely air-conditioned hospital, all modern equipment, piped oxygen and suction, in a growing city of 30,000. This is a section of the country that is developing rapidly with almost unlimited possibilities in the future. C.R.N.A. wanted to join staff of four anesthetists. Salary $575 per month. Phone collect: Administrator or Director of Anesthesia Department, Singing River Hospital, Pascagoula, Mississippi. Phone SO 206121.

REGISTERED NURSE ANESTHETIST or eligible for registration. University of Rochester School of Medicine and Dentistry. Salary commensurate with experience. Bonus for night calls. Uniforms and laundry furnished. Major Medical Insurance, Social Security and Retirement Insurance. Please state training and experience when applying. Mrs. Helen M. Geiss, 260 Crittenden Blvd., Rochester 20, New York, care of Anesthesia Division.

NURSE ANESTHETIST — For 205 bed, fully approved, general hospital in Southern Michigan. Large expansion program under way. Annual vacation, six holidays, accumulated sick leave, Social Security. For experienced person, starting salary will be $500 a month plus meals while on duty. Extra pay for overtime, for time on call, and for calls. Contact: Administrator, W. A. Foote Memorial Hospital, Jackson, Michigan.

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Berger, Olive L.: The Use of Respirators in the Immediate Postoperative Period. J. Am. A. Nurse Anesthetists. 27:182, Aug. 1959.

Adriani, John: The Chemistry of Anesthesia. Springfield, Ill. Charles C Thomas, 1952.

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Manuscripts should be submitted to the Editor of the Journal of the American Association of Nurse Anesthetists, Suite 3010, 130 E. Randolph St., Chicago 1, Illinois.